

# **DESCRIPTION, OPERATION, INSTALLATION AND MAINTENANCE MANUAL**

**DOCUMENT NUMBER: 570-5000 REV. A**



## **ARTEX 406 MHz EMERGENCY LOCATOR TRANSMITTERS**

**C406-2  
C406-2HM**



**ARTEX AIRCRAFT SUPPLIES, INC.  
REGISTERED TO ISO9001  
AND AS9100  
FILE NUMBER A10217**

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		406 MHz ELT Change of Ownership/Change of Registration Form (U.S.) 570-1023 Rev B
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# SYSTEM DESCRIPTION

## 1.1. SYSTEM DESCRIPTION

The ARTEX C406-2 series ELT's (C406-2 and C406-2HM) are a "third generation ELT," transmitting on 121.5, 243.0 and 406.025 MHz. The ELT's are designed to meet or exceed the requirements of TSO C91a, TSO C126 and the mandatory automatic ELT requirements of FAR Part 91. The ELT meets the requirements of Canadian Aviation Regulations (CAR) Part V, Subpart 51, Airworthiness Manual Section 551.104. In addition, these ELT's are designed to meet the requirements of Eurocae ED-62.

The C406-2 series ELT's employ a completely new transmitter which features higher output power and a more integrated design. The 121.5/243.0 MHz section of the transmitter is contained in a module with the 406.025 MHz transmitter. The top circuit board contains the microprocessor that controls the module and all ELT functions. The C406-2 is a dual output ELT, as all previous models of Artex 406 MHz ELT's have been.

The ELT automatically activates during a crash and transmits the standard swept tone on 121.5 and 243.0 MHz. Every 50 seconds for 520 milliseconds (long message protocol) the 406.025 MHz transmitter turns on. During that time an encoded digital message is sent to the satellite. The information contained in that message is shown below:

- Serial Number Of The Transmitter or Aircraft ID.
- Country Code
- I.D. Code

- Position Coordinates (when coupled to an ARTEX ELT/NAV ELT/NAV Interface unit [453-6500])

Refer to Appendix D (**ELT/NAV Interface Capability**) for a detailed discussion of the interaction between the ELT, the ELT/NAV ELT/NAV Interface unit and the aircraft navigation system.

The 406.025 MHz transmitter will operate for 24 hours and then shuts down automatically. The 121.5/243.0 MHz transmitter will continue to operate until the unit has exhausted the battery power which typically will be at least 72 hours.

The ELT/NAV Interface unit allows the ELT to communicate with the aircraft's navigation system and receive position data (longitude and latitude) which the ELT will transmit in the event of a crash. Programming the ELT with the 24 bit long message protocol allows the ELT to be automatically programmed by the ELT/NAV Interface with the aircraft's 24 bit address. The ELT/NAV Interface unit must be strapped (binary "1" bits tied to ground) with the same 24 bit address as the ICAO or Mode S transponder system 24 bit address. This gives the ELT the ability to be moved from one aircraft to another without the need for manual reprogramming of the ELT. This is advantageous for fleet operators since the ELT/NAV Interface unit will automatically reprogram the ELT with the new aircraft's 24 bit address identification.

One advantage of the 406.025 MHz transmitter is that it will produce a much more accurate position, typically 1 to 2 kilometers as compared to 15 to 20 kilometers for 121.5/243.0 MHz

transmitters. When coupled with the aircraft's navigation system the position accuracy improves to approximately 100 meters. The ELT also transmits a digital message which allows the search and rescue authorities to contact the owner/operator of the aircraft through a database. Information contained in the database that may be useful in the event of a crash is shown below:

- Type of Aircraft
- Address of Owner
- Telephone Number of Owner
- Aircraft Registration Number
- Alternate Emergency Contact

Once the ELT is activated and the 406.025 MHz signal is detected from the satellite and a position is calculated, the 121.5/243.0 MHz transmissions are used to home in on the crash site. Because aircraft communication radios are not capable of receiving 406.025 MHz transmissions, the only method of monitoring the ELT is the blinking cockpit light, the buzzer or the 121.5/243.0 MHz transmissions which may be monitored on the aircraft communication transceiver.

The switch below the ELT cockpit light allows you to turn the unit on for testing and to reset the unit. You cannot "disarm" or disable the unit from the cockpit. Cockpit operation is limited to deactivating the ELT after it has been activated, or manually activating the ELT.

The C406-2 series ELT's are housed in a high impact fire resistant polycarbonate plastic case. The ELT unit is able to withstand extremely harsh environments. Units, exactly like

yours, have been subjected to numerous 500g shock pulses, 1000 pound crush weights and severe penetrator tests, and continue to operate normally. Continued operation in a temperature range of -20 degrees C through +55 degrees C is assured.

### 1.1.1. LINE REPLACEMENT UNITS (LRU)

#### 1.1.2. The C406-2 series system consists of the following components:

##### ELT Unit

- a. G-Switch
- b. Transmitter
- c. Microprocessor
- d. Miscellaneous components
- e. "ON" Light
- f. Transmitter Module

##### Battery Pack

##### Fixed Antenna

##### Connecting Coax Cable

##### Mounting Tray

##### Protective Top Cover

##### Mounting Tray End Cap

##### Cockpit Remote Switch Assembly

##### Buzzer

##### Installation Kit

## 1.2. TRANSMITTER CHARACTERISTICS

The printed circuit assembly (PCA) of the C406-2 series ELT is unique in that the PCA has no RF function but rather only control functions for the RF module. The PCA contains a one time programmable microprocessor that controls all the ELT functions (ON/OFF, modulation, 406 MHz digital message and RESET).

All RF functions are contained in a separate module. The transmitter operates simultaneously on 121.5 and 243.0 MHz with the carrier frequencies remaining within 0.005% under all environmental operating conditions. Approximately every 50 seconds the 406.025 MHz transmitter transmits. During this time the 121.5 and 243.0 MHz transmitter is momentarily turned off.

### 1.2.1. 121.5/243.0 MHz TRANSMITTER

The AM modulation at 121.5 and 243.0 MHz is designated as A9 with the carrier amplitude modulated with an audio frequency sweeping downward over a range of not less than 700 Hz, within the range of 1,600 to 300 Hz. The sweep repetition rate is between 2 and 4 Hz with a modulation factor of at least 0.85. The modu-

lation applied to the carrier frequency has a minimum duty cycle of 33% and a maximum duty cycle of 55%.

The ARTEX C406-2 series ELT is designed for a constant power output at 121.5 and 243.0 MHz that will not be less than 23 dBm (200 mW) during the 50 hour operational period at both -20 degrees Centigrade and +55 degrees Centigrade.

### 1.2.2. 406.025 MHz TRANSMITTER

A digital information message is sent to the satellite via the 406.025 MHz transmitter. The modulation is phase modulated and classified as 16K0G1D. Every 47.5 to 52.5 seconds the 5 Watt transmitter is turned on for 440 mS (short message) or 520 mS (long message)

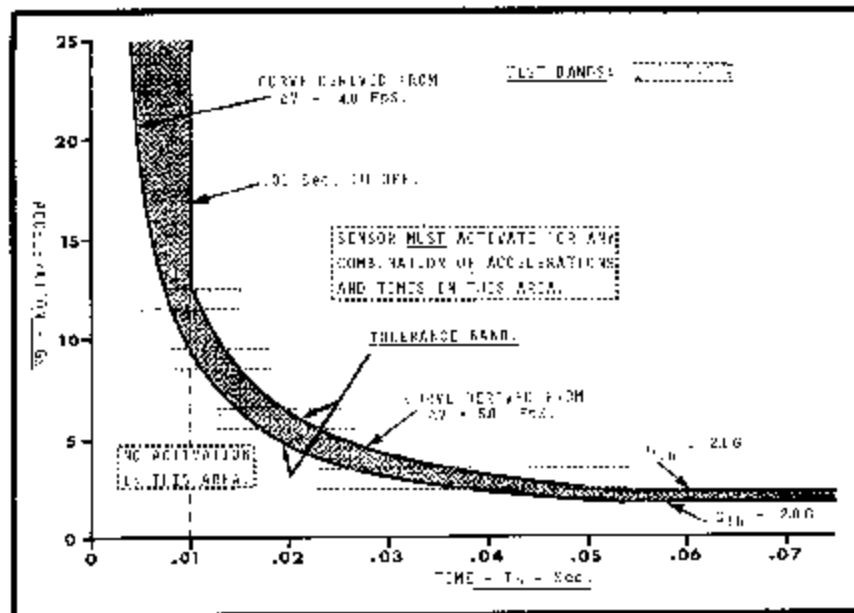


FIGURE 1-1 G-SWITCH CURVE

The information sent to the satellite is programmed at the factory and contains a unique number that can be used to identify the beacon.

### 1.3. FCC REQUIREMENT

The ELT shall maintain a frequency stability of 50 parts per million on 121.5 and 243.0 MHz. This allows a variation of plus or minus 6.075 KHz at 121.5 MHz.

On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth the power is to be attenuated at least 25 dB.

On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of authorized bandwidth the power is to be attenuated at least 35 dB.

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth the power is to be attenuated at least 40 dB.

There are no equivalent FCC requirements for the 406.025 MHz frequency.

### 1.4. TSO REQUIREMENTS

To gain TSO approval of a 406.025 MHz ELT it is necessary to meet the requirements of TSO C126. The following sections contain descriptions of components necessary to meet TSO C126 with the ARTEX C406-2 series ELT's.

#### 1.4.1. ACTIVATION MONITOR

An aural and/or visual monitor is provided to alert the pilot when the ELT has been activated and is transmitting.

The following requirements apply to the activation monitors:

a. Aural Monitor - The aural monitor provides a distinct signal enabling a search and rescue team to locate an aircraft with a transmitting ELT in a confined area with a large number of aircraft (i.e. such as an airport). The search and rescue team would listen for the aural monitor and easily locate and disable the offending ELT without a great deal of effort.

b. Visual Monitor - The visual monitor is designed to be installed so that it can be viewed from the pilot's position. Its intended function is to inform the pilot that the ELT is transmitting, avoiding a situation where an aircraft is flying with its ELT transmitting.

#### 1.4.2. G-SWITCH

The crash force activation sensor or G-Switch is designed to activate with a change of velocity of 4.5 fps +/-0.5 fps both under normal conditions and while being subjected to 30 G's of cross axis forces. Figure 1-1 shows the plot of time versus G Force that the G-Switch must be qualified to in order to meet ED-62 approval criteria. The FAA has allowed the use of this G-Switch under TSO C126.

#### 1.4.3. BATTERY PACK

The Battery Pack for all the C406-2 series ELT's consists of 4 "D" size

Lithium Manganese Dioxide cells connected in series. In an effort to increase the safety of the battery pack, a number of features were designed into the battery pack. To prevent the cells from being charged, diodes are connected across each cell and fuses are connected to the output.

#### 1.4.4. REMOTE CONTROL

The remote control (cockpit panel switch) provides "MANUAL ON," "ARMED," and "RESET" modes. The remote control wiring between the control and the ELT is designed so that no combination of short circuits between the remote control, monitor(s), associated wiring and the airframe will:

- Inhibit the equipment from being automatically activated.
- Deactivate the ELT after it has been activated.
- Result in additional power drain so that the ELT will not meet the minimum Peak Effective Radiated Power (PERP) of 17 dBm or Equivalent Isotropic Radiated Power (EIRP) of 20 dBm through the 50 hour operation period at any of the specified operating temperatures (-20° C to +55° C).

### 1.5. ARTEX Dual Input Antennas

All of the ARTEX 406 dual element antennas are designed to work with any of the ARTEX Dual output 406 ELT's including the C406-2 and C406-2HM.

#### 1.5.1. Rod Antenna (Dual Input)

The 110-320 Rod Antenna (refer to Figure 1-2) is intended for lower speed aircraft that do not exceed 350 knots TAS.

##### 110-320 SPECIFICATIONS

- Freq: 121.5, 243.0 & 406.025 MHz
- VSWR : 2.0:1 Max. for 121.5/243.0 MHz  
1.5 Max. for 406.025 MHz
- Polarization: Vertical
- Radiation Pattern: Omnidirectional
- Airspeed Rating: 350 Knots TAS
- Connectors: BNC & TNC

#### 1.5.2. Blade Antennas (Dual Input)

The 110-337 Blade Antenna (refer to Figure 1-3) is the ARTEX antenna of choice for use on aircraft that do not exceed Mach 1.

##### 110-337 SPECIFICATIONS

- Freq: 121.5, 243.0 & 406.025 MHz
- VSWR: 2.0:1 Max at 121.5/243.0 MHz  
1.50:1 Max for 406.025 MHz
- Polarization: Vertical
- Radiation Pattern: Omnidirectional
- Airspeed Rating: Mach 1
- Connectors: BNC & TNC

The 110-333 Blade Antenna (refer to Figure 1-4) is intended for use on aircraft that do not exceed Mach 1.

##### 110-333 SPECIFICATIONS

- Freq: 121.5, 243.0 & 406.025 MHz
- VSWR: 1.75:1 Max for 121.5/243.0 MHz  
1.50:1 Max for 406.025 MHz

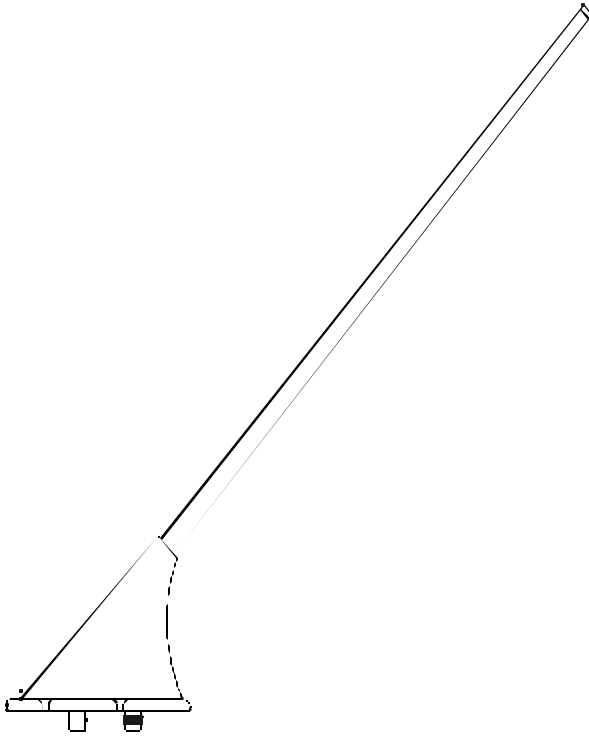


- Polarization: Vertical
- Radiation Pattern: Omnidirectional
- Airspeed Rating: Mach 1.
- Connectors: BNC & TNC

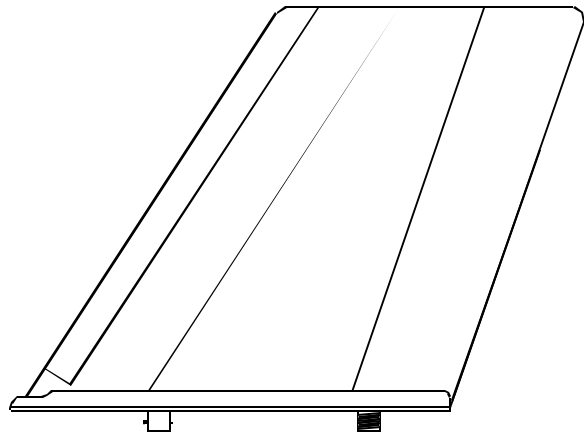
The 110-328-01 Blade Antenna (refer to Figure 1-5) is intended for use by OEMs who have previously designed this antenna into their applications on higher speed aircraft that do not exceed Mach 1.

**110-328-01 SPECIFICATIONS**

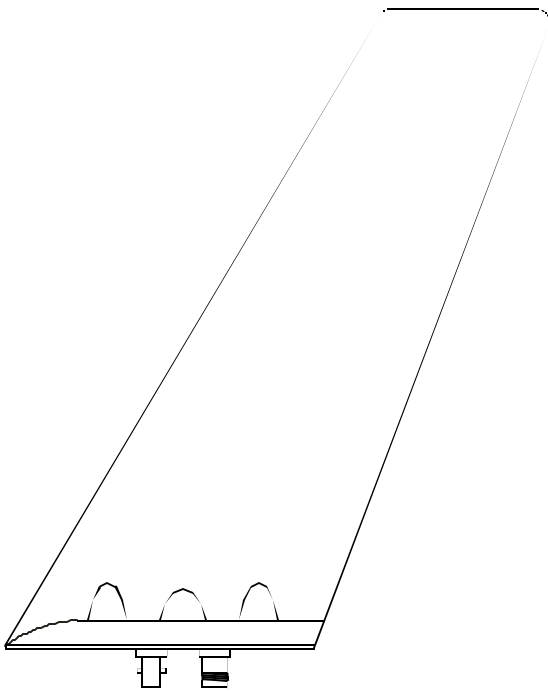
- Freq: 121.5, 243.0 & 406.025 MHz
- VSWR: 2.0:1 Max at 121/5/243.0 MHz, 1.50:1 Max for 406.025 MHz
- Polarization: Vertical
- Radiation Pattern: Omnidirectional
- Airspeed Rating: Mach 1
- Connectors: BNC & TNC



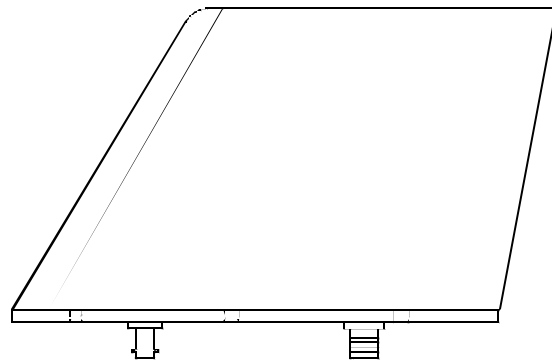
**FIGURE 1-2 ROD ANT 110-320**



**FIGURE 1-3 BLADE ANT 110-337**



**FIGURE 1-4 BLADE ANT 110-333**



**FIGURE 1-5 BLADE ANT 110-328-01**

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## **C406-2 OPERATION**

## 2.1. Operation

One of the primary features of the C406-2 series ELT's are their simplicity of operation. As long as the ELT is locked into its mounting tray, it will activate in a crash. Neither the cockpit switch nor the ELT unit switch can be positioned to prevent automatic activation once the unit is mounted properly.

It also is designed against human error and misuse in regards to automatic activation. The unit activates only when securely mounted in its tray and has pins 5 & 8 jumpered. The ELT cannot be accidentally activated by dropping, rough handling or during shipping.

When the ELT is activated, the presence of the emergency swept tone and a flashing front panel light indicates a normally functioning unit. The front panel light must immediately begin to continuously flash upon ELT activation.

Under normal operation the switch configuration on your front panel is the down position, reading "ARM". The switch on the ELT unit will also be positioned down to read "OFF". Should an emergency arise to the degree that you want to manually activate your ELT, reverse either switch so it is in the up ("ON") position. Remember, that as long as the front panel and ELT switches are in the ARM /OFF position the ELT will automatically activate on impact.

If your ELT is activated accidentally, you will need to reset it. Do this by moving the front panel switch to "ON", then immediately rocking it back to "ARM". You may also reset the ELT at the unit itself by positioning the switch on the ELT up to "ON", then immediately back down to "OFF".

## 2.2. Overall Functions

Figure 2-1 shows the functional flow for the ELT. The ELT unit is considered to be either "ACTIVE" or "INACTIVE". When "INACTIVE", the unit lies in a state of rest and performs no functions. Taking the unit from the "INACTIVE" to the "ACTIVE" state requires a positive switch transition from one of three sources:

- Panel Mounted Switch
- Unit Mounted Switch
- G-switch

Upon entering the "ACTIVE" state, the unit shall meet all the requirements as described herein. To exit the "ACTIVE" state and enter the "INACTIVE" state, a "RESET" condition must be entered. This may be accomplished in one of two ways.

(a) The front panel switch may be toggled from the "ARMED/RESET" position to "ON" and then back to "ARMED/RESET", or if the switch is already in the "ON" position, it must be placed into the "ARMED /RESET" position.

(b) The ELT unit switch may be moved from the "OFF" position to the "ON" position and then back to the "OFF" position. If the switch is already in the "ON" position, it must be placed into the "OFF" position.

It should be remembered that the ELT can not be "RESET" if either the panel mounted switch or the unit switch is in the "ON" position.

The periodicity of operational checks is at the operator's discretion, however, a monthly test is recommended. The check shall only be conducted during the first five minutes of any UTC (coordinated universal time) hour, and restricted in duration to not more than five seconds.

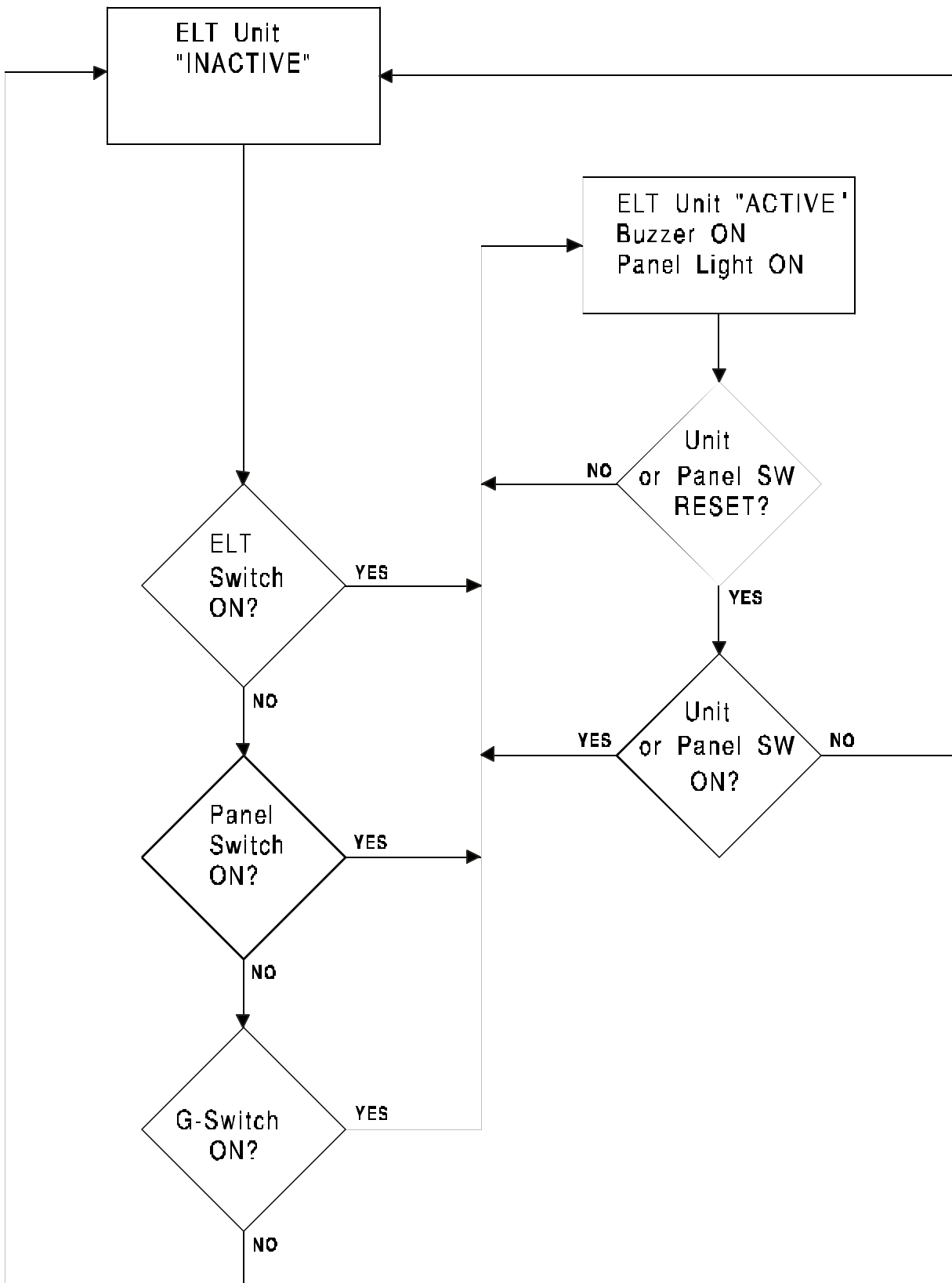


FIGURE 2-1 ELT FUNCTIONALFLOW

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# **INSTALLATION**

## PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY!

TSO C126 PARAGRAPH D REQUIREMENTS:

*"The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article on a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and it is approved by the administrator."*

The ELT is designed with the installer in mind. Extra effort has been made to simplify the installation process.

Because of the critical nature of an ELT, it is very important that the installation be performed according to the following instructions. Installation

of the ELT is somewhat unique; it requires experience in sheet metal work and avionics. Only licensed technicians should install the ELT.

Many problems associated with the older ELTs were due to poor installations. **Many of those poor installations occurred at the factory on new airplanes. Therefore, duplicating a previous ELT installation with the ARTEX ELT may not be acceptable.**

In addition to the procedures outlined herein, the installer must adhere to the guidelines established in FAA-Advisory Circular 43.13-2A (Acceptable Methods, Techniques and Practices -Aircraft Alterations). Specifically, Chapters 1 through 3, 11 and 13.

By signing either the aircraft logbooks or the FAA Form 337, you are stating that the installation has been performed in accordance with the current FARs and with the steps and procedures outlined herein.

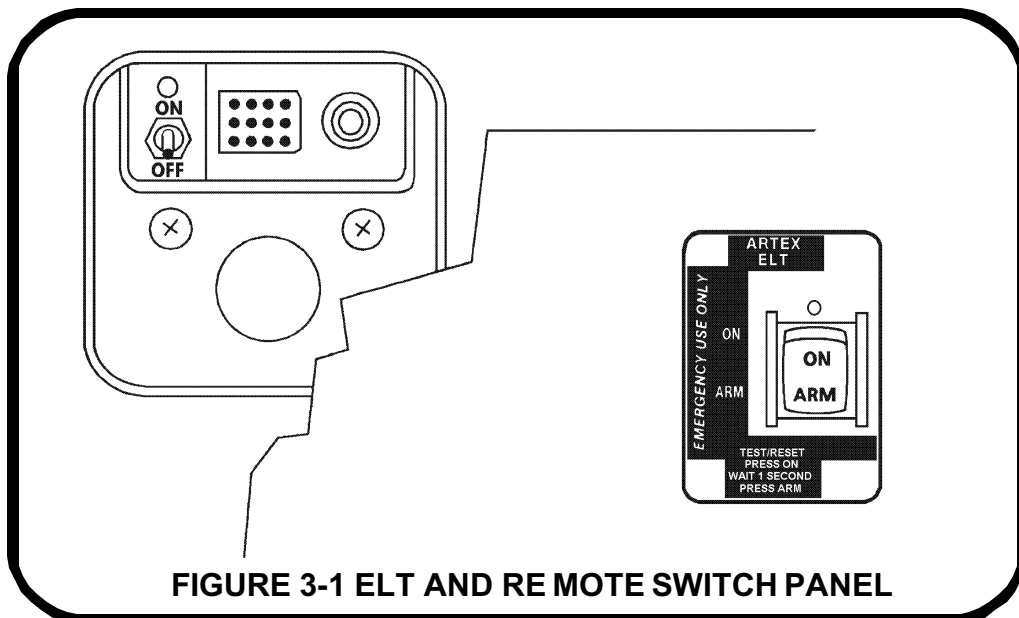


FIGURE 3-1 ELT AND REMOTE SWITCH PANEL

In Canada, all installations must be performed in accordance with Canadian Aviation Regulations (CAR) Part V, Subparts 37, 51 and 71.

### 3.1. ELT Mounting Locations

Many original ELT installations are inadequate as far as unit location and surface rigidity are concerned. Just because the "old" ELT was located in a particular position doesn't mean the "new" ELT should be located there.

Statistics show that the tail section of an airplane is least likely to be damaged during a crash and, therefore, provides a good mounting environment for the ELT unit.

Accessibility of the unit is an important factor in the location of the ELT. Mount the unit as far aft as practical,

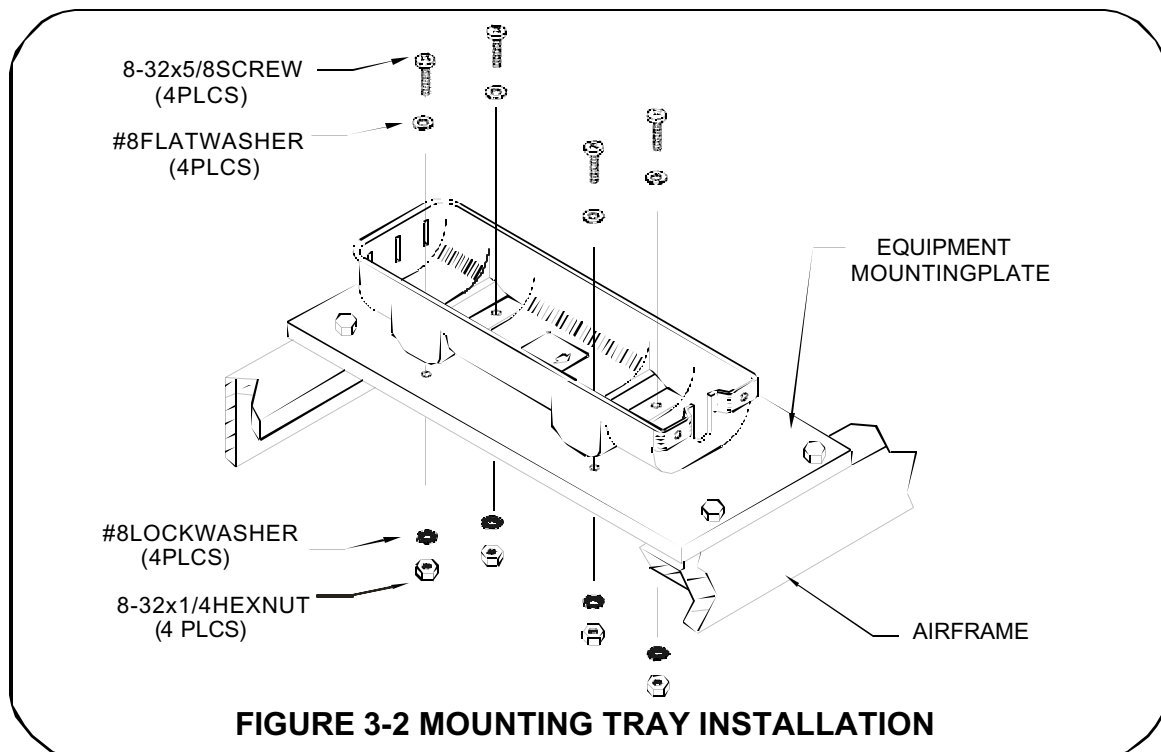
but where it can be easily retrieved for maintenance.

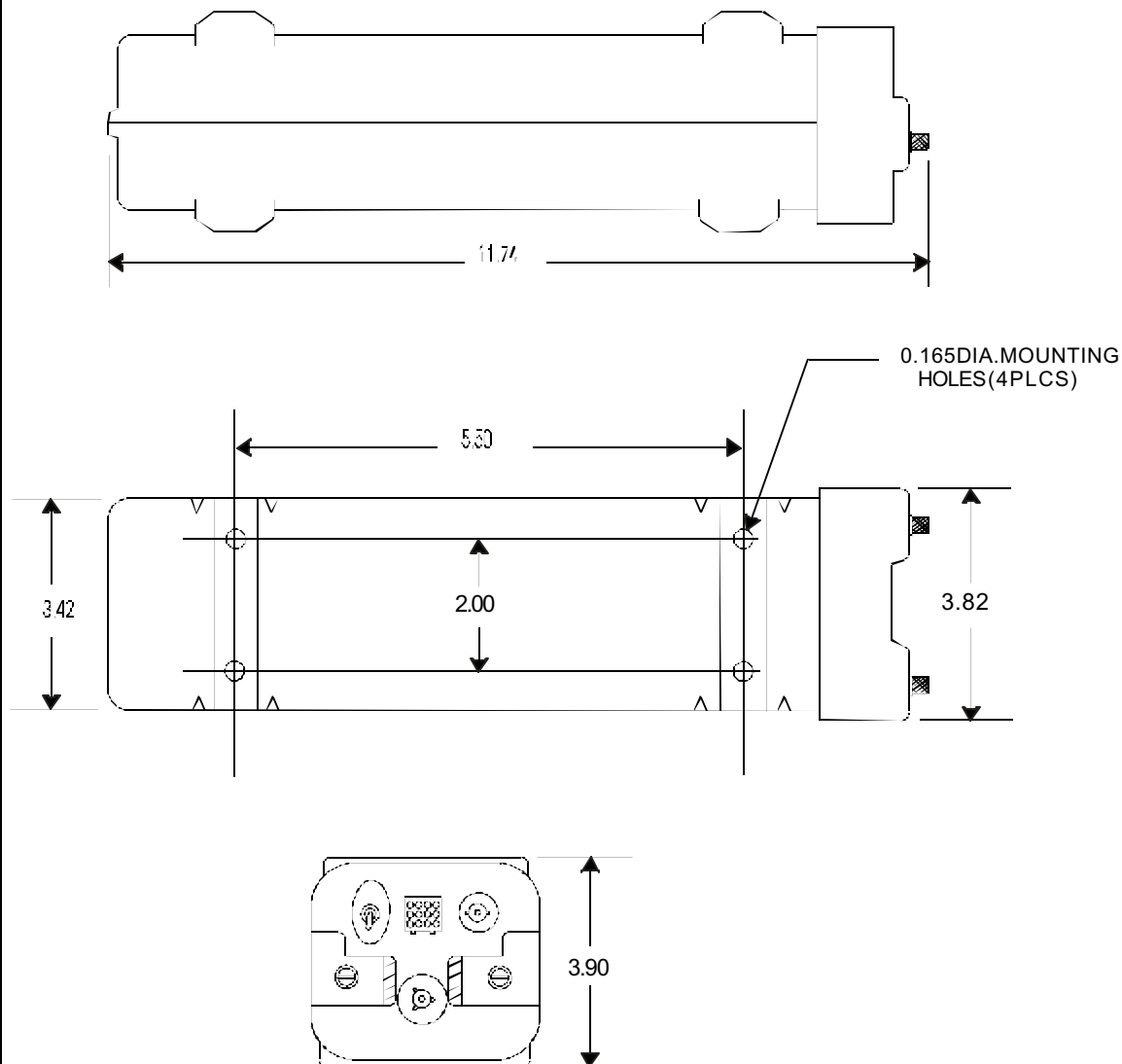
The mounting surface must be extremely rigid, therefore, mounting the ELT directly to the aircraft skin is unacceptable.

Mounting an ELT directly to the aircraft skin induces "crash hiding" vibrations and provides a very poor structural mounting surface. The mounting location must be able to support 100 pounds of force in any direction with no appreciable distortion in the structure.

The following are the FAA guidelines for mounting an ELT (per RTCA DO-183 Sec 3.1.8)

- "The ELT shall be mounted to primary aircraft load carrying structures such as trusses, bulk heads, longerons, spars, or floor beams."

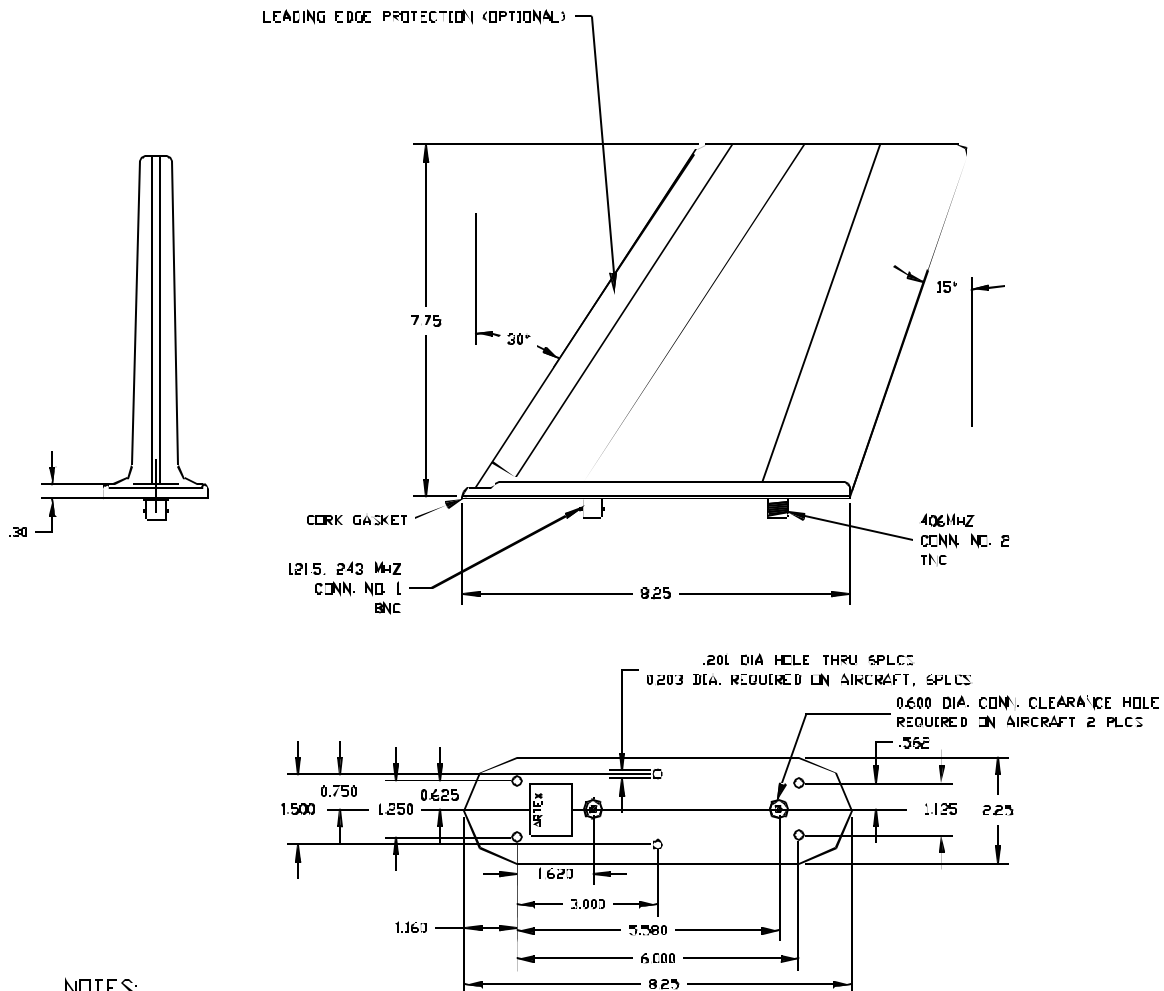




## NOTES:

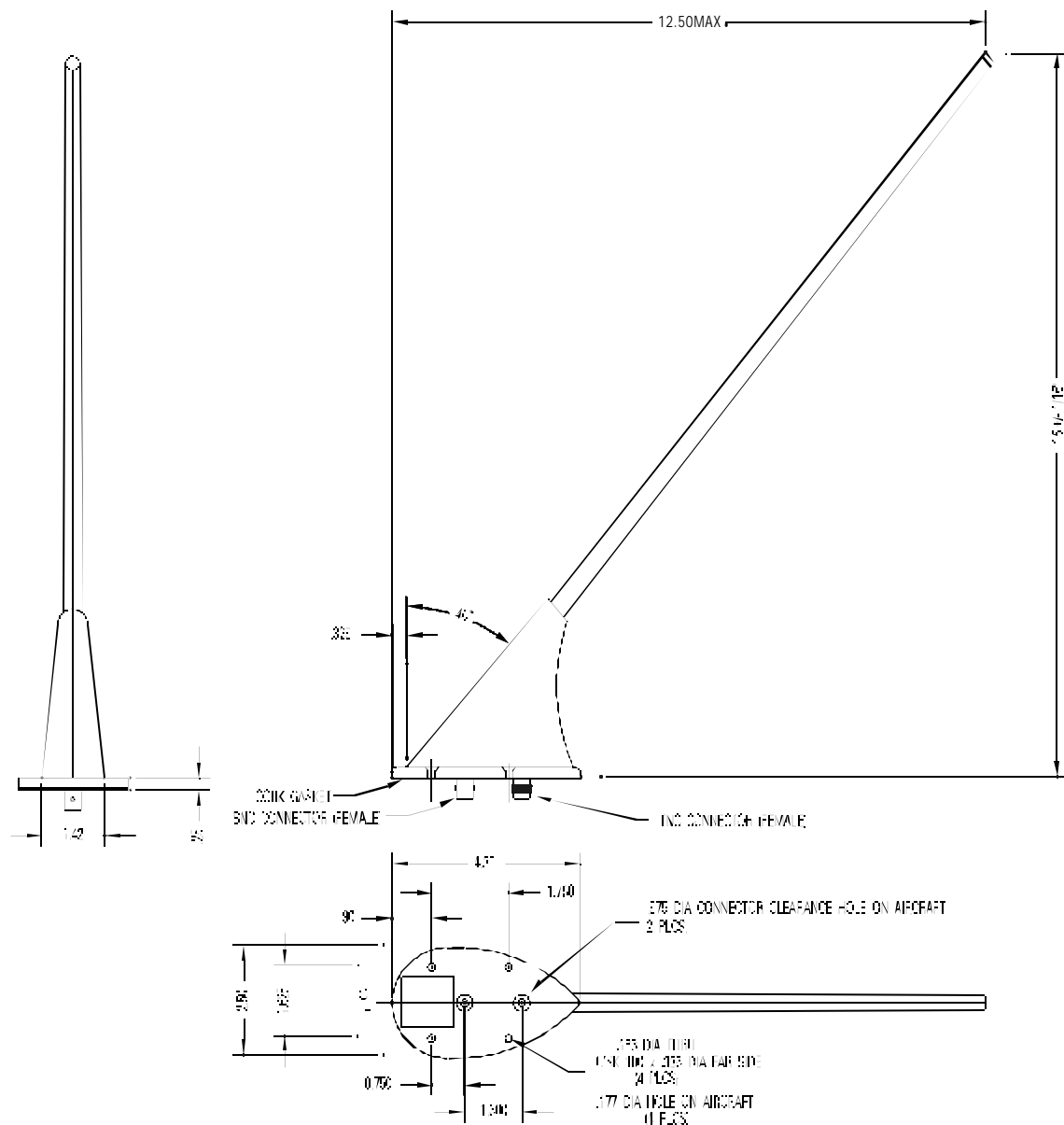
1. Allow 5 inches minimum clearance for endcap removal and installation.
2. Unit Weight: 4 lbs., 7 oz.
3. Unit Color: Orange
4. Unit Coax Connectors: BNC (121.5/243.0 MHz) and TPS (406.025 MHz).
5. Mating plug does not extend beyond exterior surface of endcap.
6. Tolerances are 0.030 inches.
7. Recommended interconnect harness wire gauge is 22 AWG minimum.
8. Pins 5 and 8 of the external connector must be jumpered to enable G-switch.

FIGURE 3-3 ELT OUTLINE DIMENSIONS

**NOTES:**

1. WEIGHT: 1.3 LBS.
2. FINISH: WHITE POLYURETHANE PAINT.
3. FREQUENCIES: 1215, 243.0, 406 MHZ.
4. NORMAL IMPEDANCE: 50 OHMS.
5. POLARIZATION: VERTICAL.
6. RADIATION PATTERN: UNIDIRECTIONAL.
7. VSWR: 1215MHZ, 2.0:1 MAX; 243MHZ, 2.0:1 MAX; 406MHZ, 1.5:1 MAX.
8. MATING CONNECTOR: BNC AND TNC.
9. RF POWER: 50 WATTS MAX.
10. HARDWARE AND TORQUE: #10-32 SCREW TO A MAXIMUM TORQUE OF 20 IN/LES DURING INSTALLATION.
11. PROVIDE A 0.6250" (5/8") DIAMETER HOLE FOR BNC CONNECTOR.
- 11A. PROVIDE A 0.6250" (5/8") DIAMETER HOLE FOR TNC CONNECTOR.
12. GASKET: CORK.
13. AIRSPEED RATING: 600 KNOTS TAS @ 25,000 FT.
14. TOLERANCES: .XX =  $\pm .030$   
.XXX =  $\pm .010$   
ANGLES  $\pm 1^\circ$
15. ALL DIMENSIONS IN INCHES.

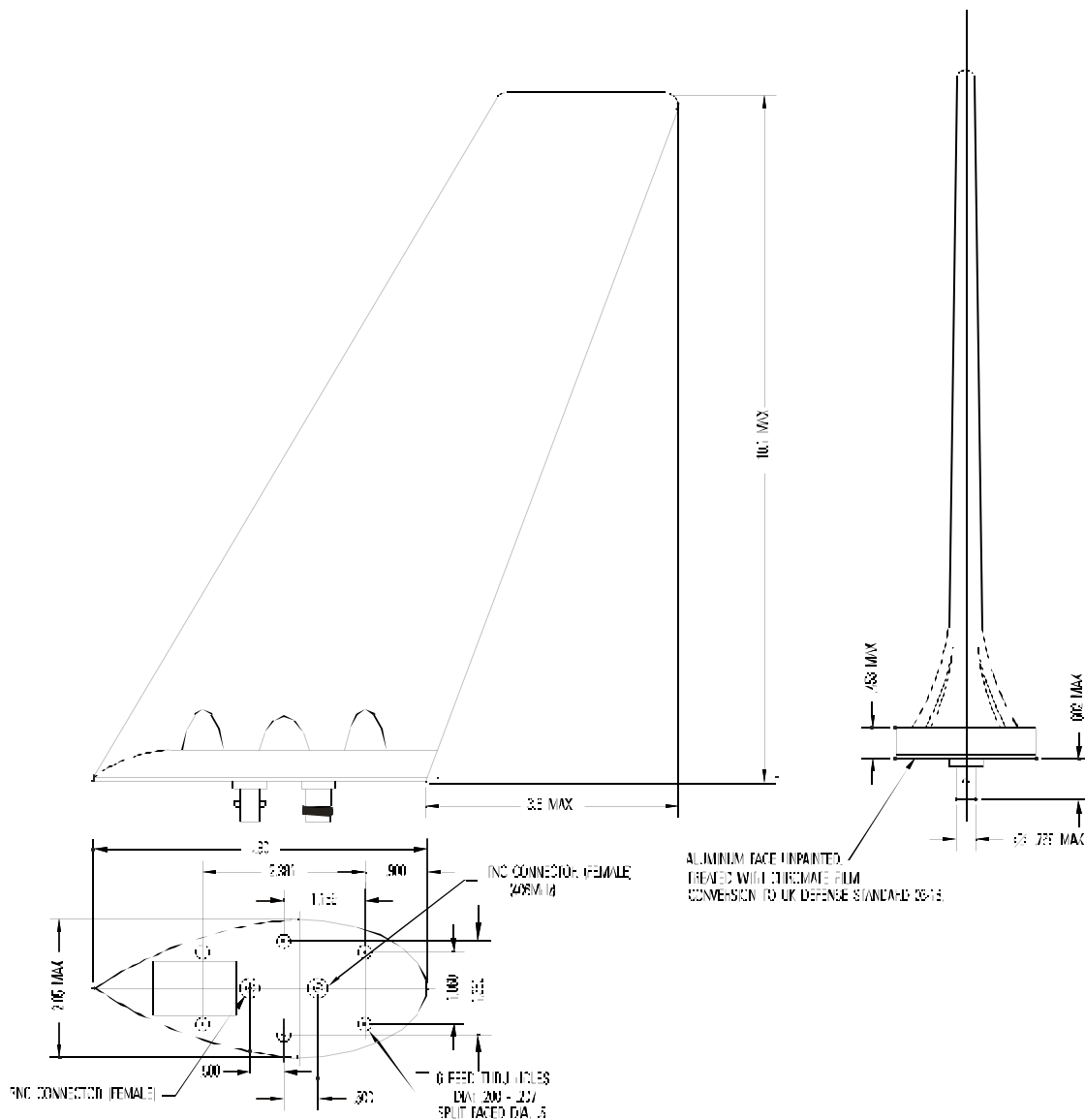
**FIGURE 3-4 BLADE ANTENNA (110-337) OUTLINE**



## NOTES:

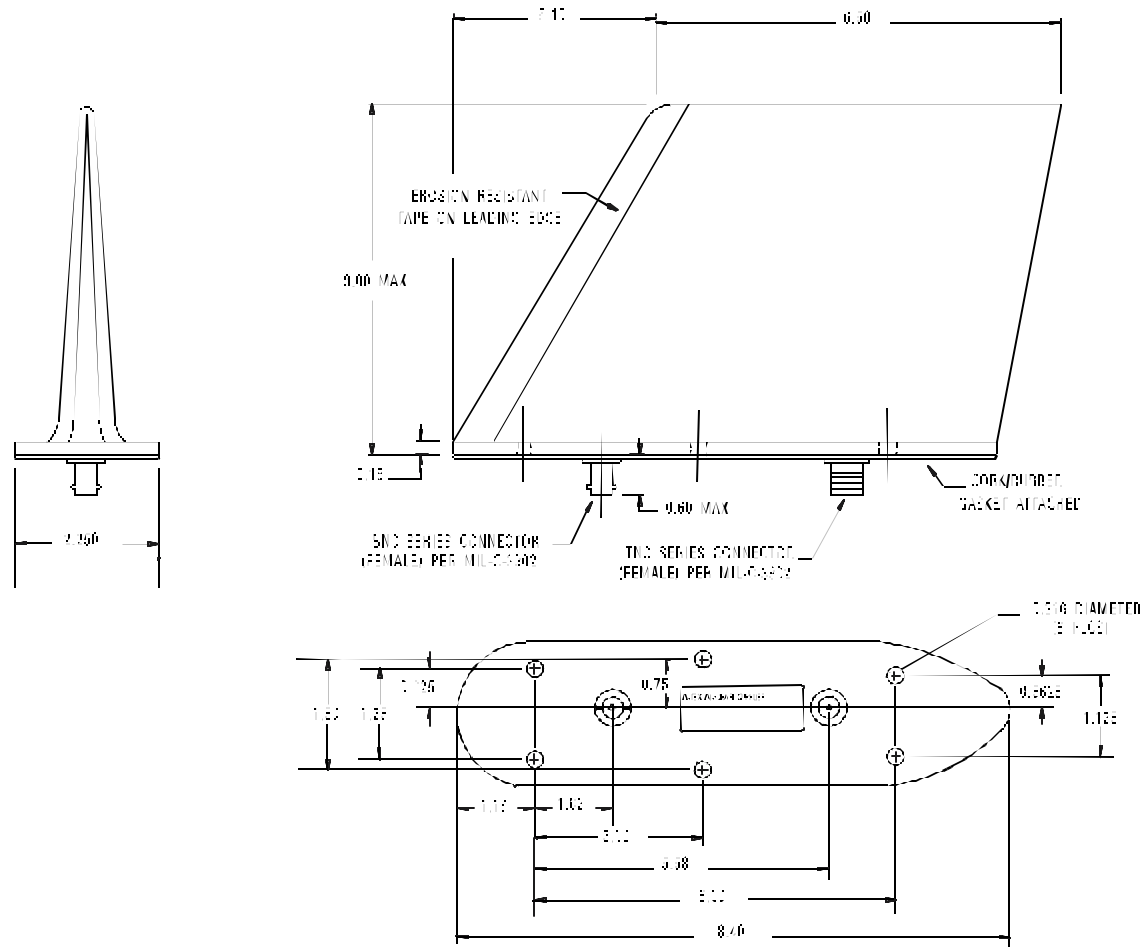
1. FREQUENCIES: 111.5, 243.0 AND 406.025 MHz
2. VSWR: 2.0:1 MAX FOR 111.5/243.0 MHz  
1.5:1 MAX FOR 406.025 MHz
3. IMPEDANCE: 50 OHMS NOMINAL
4. RADIATION PATTERN: OMNI-DIRECTIONAL
5. POLARIZATION: VERTICAL
6. ENCAPSLATING MATERIAL: POLYURETHANE FOAM FILLED FIBERGLASS ROD
7. MATING CONNECTOR: RNC FEMALE AND TNC FEMALE
8. WEIGHT: 1.45 LBS
9. FINISH: WHITE POLYURETHANE PAINT
10. A TORQUE FORCE OF 20 IN/LBS IS RECOMMENDED ON MOUNTING SCREWS
11. ALL DIMENSIONS IN INCHES
12. MAXIMUM AIR SPEED RATING: 145 KNOTS TAS

FIGURE 3-5 ROD ANTENNA (110-320) OUT LINE

**NOTES:**

1. **FREQUENCIES: 121.5, 243.0 AND 406.025 MHz.**
2. **VSWR: 2.0:1 OR BETTER @121.5/243MHz**  
1.5:1 OR BETTER @406.025MHz
3. **POLARIZATION: VERTICAL**
4. **RADIATION PATTERN: OMNIDIRECTIONAL**
5. **MATING CONNECTORS: BNC FEMALE AND TNC FEMALE**
6. **FINISH: GLOSS WHITE EPOXY TO UK DEFENSE STANDARD 80-181**
7. **WEIGHT: .78 LBS**
8. **NOMINAL IMPEDANCE: 50 OHMS**
9. **MOUNT ANTENNA USING 100° COUNTERSUNK HEAD #10 SS MACHINE SCREWS AND ASSOCIATED HARDWARE.**
10. **TORQUE MOUNTING FASTENERS TO 25-26 IN/LBS**
11. **MAXIMUM AIR SPEED: MACH 1**

**FIGURE 3-6 BLADE ANTENNA (110-333) OUTLINE**



## NOTES:

1. WEIGHT: 1lb 2.2 oz MAXIMUM
2. FINISH: WHITE POLYURETHANE PAINT
3. FREQUENCY: 121.5 AND 243.0 MHz AND 400.095 MHz
4. NOMINAL IMPEDANCE: 50 OHMS
5. POLARIZATION: VERTICAL
6. RADIATION PATTERN: OMNIDIRECTIONAL
7. VSWR: 2.0:1 @ 121.5/243MHz  
1.5:1 OR BETTER @ 406.025MHz
8. AIRSPEC RATING: MACH 1 1/3 @ 5-A (H/F)
9. MATING CONNECTORS: 3NC FEMALE AND 1NC FEMALE
10. PROVIDE A 0.625" (1/16") DIAMETER HOLE FOR 3NC CONNECTOR  
AND A 0.75" (3/16") DIAMETER HOLE FOR 1NC CONNECTOR
11. MOUNT ANTENNA USING 10" COUNTERBUNK HEAD #10 SS MACHINE SCREWS  
AND ASSOCIATED HARDWARE
12. TORQUE 20-25 INCHES ON MOUNTING SCREWS DURING INSTALLATION.
13. ALL DIMENSIONS IN INCHES DRAWN TO SCALE

### FIGURE 3-7 BLADE ANTENNA (110-328-01) OUTLINE



- "The mounts shall have maximum static local deflection no greater than 2.5 mm(0.1in) when a force of 450 newtons (100lbs) is applied to the mount in the most flexible direction. Deflection measurements shall be made with reference to another part of the airframe not less than 0.3 meters (1 foot) nor more than 1.0 meters (3 feet) from the mounting location."
- In addition, RTCA Document Number DO-182 recommends that "all ELT system components which must survive a crash in tact, ....should be attached to the air frame in such a manner that the attachment system can support a 100g load...in the plus and minus directions of the three principal axes of the aircraft."
- Further installation guidance can be found in FAA Advisory Circular 43.13-2A (Acceptable Methods, Techniques and Practices - Aircraft Alterations). Chapter 2, paragraph 28 deals specifically with Emergency Transmitter installations.

Mount the ELT unit horizontally so that the rigidity requirements are met and the arrow on the mounting tray is aligned within 10 degrees of the longitudinal axis of the aircraft and pointed in the direction of flight. Refer to page 3-19 & Figure 3-13 for helicopter installations.

Finally, in selecting a location for the ELT installation, the following cautionary advice should be taken into consideration:

**CAUTION:**

Avoid locating the ELT where it will be subjected to unprotected exposure to harsh chemical fluids such as deicing compounds. They can promote cracking and fracturing of the ELT mounting frame and housing components by degrading and weakening the structural integrity of the housing and tray material. These same chemical agents can also cause corrosion on electrical connections.

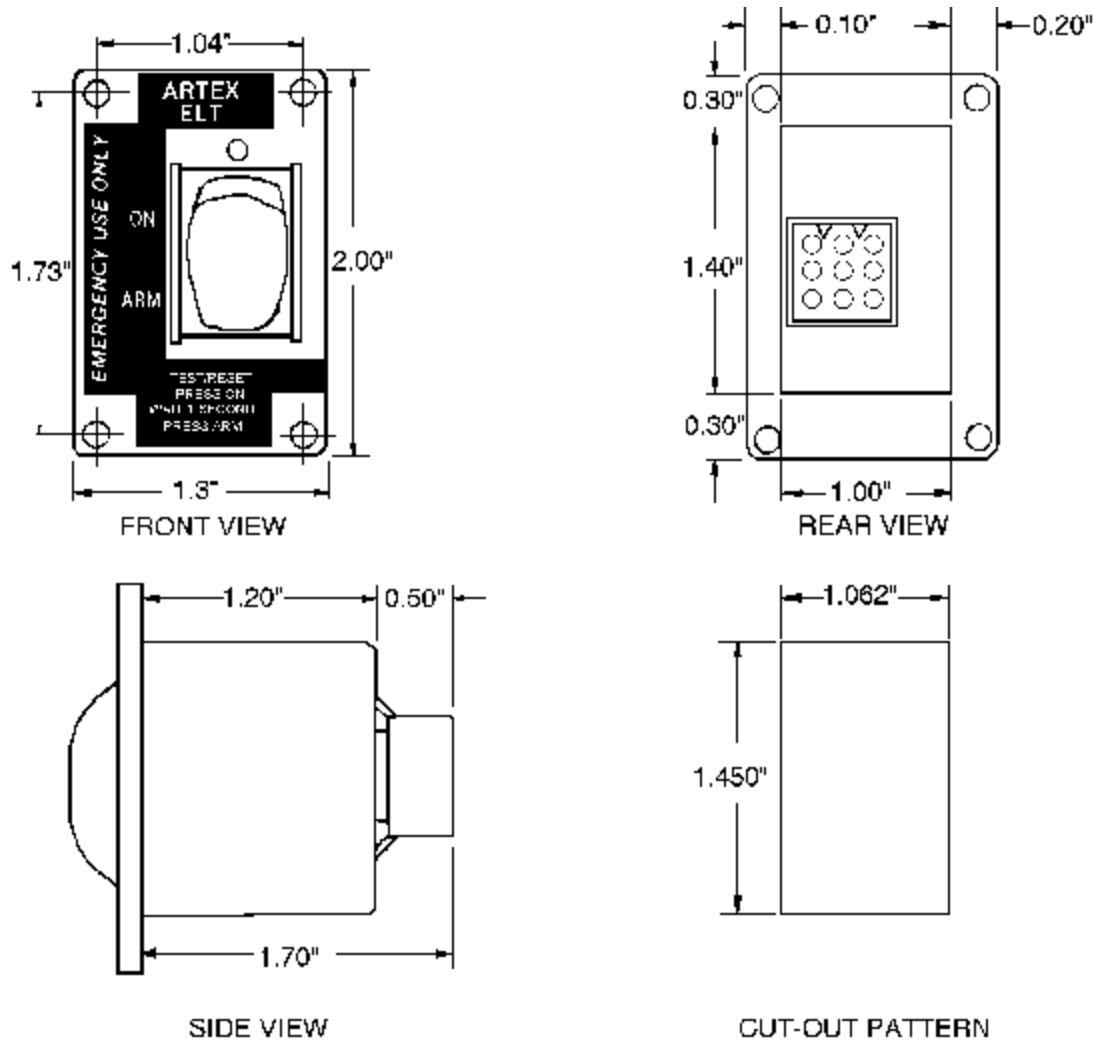
### 3.2. Antenna Mounting Locations

Locate a position where the antenna can be installed **VERTICALLY** (up to 15° off the vertical plane is acceptable) with at least 30 inches clearance from other antennas (especially VHF) mounted on the aircraft.

The coax cable should not cross any production breaks (major structural sections) in the aircraft so that in the event of a crash the ELT and the antenna are in same aircraft section. This usually requires placing the antenna directly above the ELT unit. Do not bundle the ELT antenna coax with any other VHF radio coax, power harness or the ELT remote switch harness.

If the ELT transmitter and external antenna are on opposite sides of an airframe production break, the components should be secured to each other by a tether which can support a 100 G load (ELT weight x 100). The interconnecting antenna-to-ELT coax cable should have sufficient slack on both ends that it will not be subjected to any tensile load and should be tied loosely to the tether.

Use only the ARTEX approved antennas. The ELT will not operate properly without being connected to the antenna for which it was designed.



**FIGURE 3-8 REMOTE SWITCH OUTLINE DIMENSIONS**

FAA Advisory Circular 43.13-2A, Chapter 3, paragraphs 36 through 38 provides additional guidance for antenna installations.

### 3.3. Installing the Mounting Tray

Refer to figures 3-2 & 3-3

Before installing the tray, be sure the mounting location meets the requirements established in ELT Mounting Locations.

**NOTE:** Although the Top Cover also has 4 holes, do not use for mounting the ELT.

Mark the 4 holes needed for the tray using the tray as a guide. Be sure the arrow, on the tray, aligns within 10 degrees of the longitudinal axis of the aircraft (and in direction of flight).

Also make sure there is sufficient room in front of the tray to easily remove the front cap (at least 5" is recommended).

If a reinforcement (doubler) plate is needed to meet the rigidity requirements, fabricate one using the tray as a guide.

Drill the 4 marked holes with the #19 (.1660) drill bit and install the tray with the 8-32 X 5/8" pan head phillips screws, nuts, flat washers and lock washers provided.

### 3.4. Installing the Antenna

Ensure that the antenna mounting location meets the requirements as described in Antenna Mounting Locations.

A doubler plate will most likely be necessary for the antenna to meet rigidity specifications in Antenna Mounting Locations.

A 20 pound force applied in all directions should not cause an appreciable distortion in the aircraft skin.

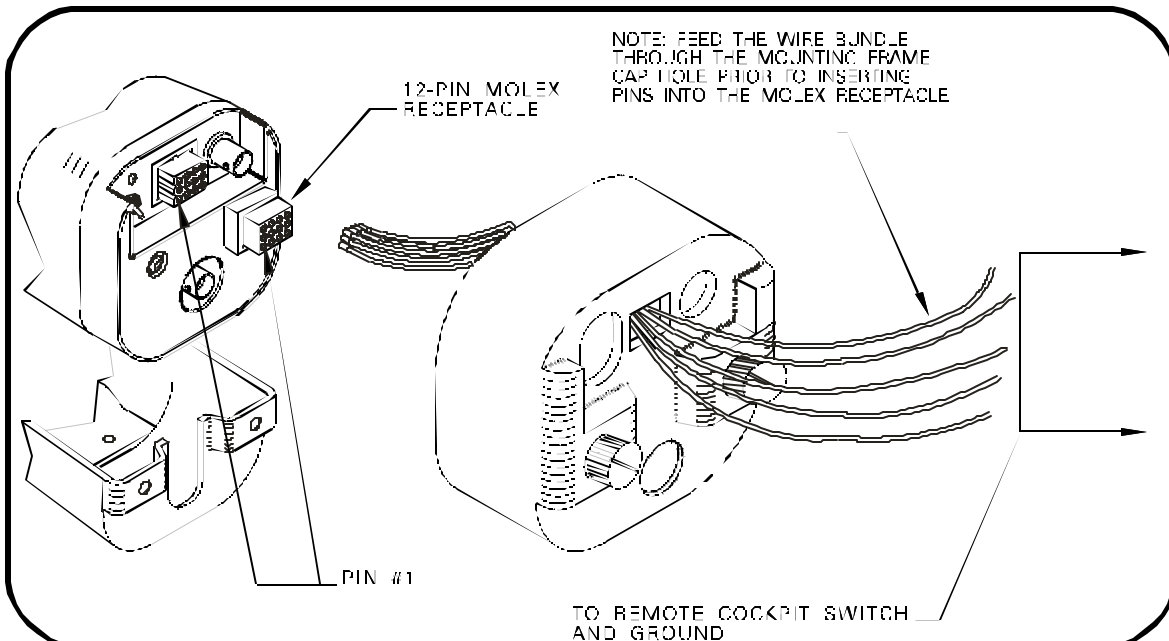
Use the antenna outline drawings (figures 3-4 through 3-12) to determine the hole pattern and drill size.

Two coax cables are provided with the C406-2. The BNC to BNC cable is for the 121.5/243.0 MHz transmitter and the TPS (ELT end) to TNC (antenna end) coax cable is used for the 406.025 MHz transmitter. To eliminate confusion caused by wrong connections the coax cables were designed to connect only one way ensuring proper operation of the C406-2. Longer coax cables (up to 20 feet) may be constructed if the six foot cables provided are too short for the installation. RG-400 or RG-142 may be used for fabricating these cables.

### 3.5. Mounting the Cockpit Light/ Switch Assembly

The switch assembly must be mounted in the cockpit where the pilot can easily

**CAUTION: Incorrect wiring of the Molex connector may damage the ELT; cause continuous transmission; or result in no remote reset. Verify wiring against Figure 3-10. A continuity check is recommended to ensure good connections and proper pin location.**



**FIGURE 3-9 ELT MOLEX CONNECTOR INSTALLATION**

reach the switch and see the light. **The remote switch is required for the ELT to be TSO C126 approved. It is not optional.**

The switch assembly requires a space about 2" high by about 1" wide both on the panel surface and behind the panel. Refer to Figure 3-8.

Mark a cutout for the cockpit panel switch with the dimensions shown in Figure 3-8.

Install the switch assembly by fitting it into the cutout, marking the 4 screw holes and drilling them with a #28 (.1405) drill bit. Use the 4-40 X 1/2" pan head phillips screws, nuts & lock washers provided.

Apply the "For Aviation Emergency Use Only /Unauthorized Use Prohibited" placard that is supplied in the Installation Kit as near the switch installation as practical.

### 3.6. Wiring the 406 System

#### **CAUTION:**

Prior to installing the harness in the 12-pin receptacle, feed the wire bundle through the rectangular hole in the mounting frame cap. The receptacle will not fit through the mounting frame cap harness entrance if the harness is installed prior to doing this.

#### **3.6.1. Fabricate the Cable**

**NOTE:** If the ELT is to be used with an Artex ELT/NAV Interface (P/N 453-6500) refer to the **ARTEX ELT/NAV Interface Installation and Operation Manual (570-4602)** for wiring instructions. Wires will need to be run which connect pins 9, 10, 11 and 12 of the ELT to the ELT/NAV Interface unit.

Fabricate a 5 wire harness (22 Gauge minimum) long enough to reach between the ELT installation location and the cockpit panel switch location. See Figure 3-9.

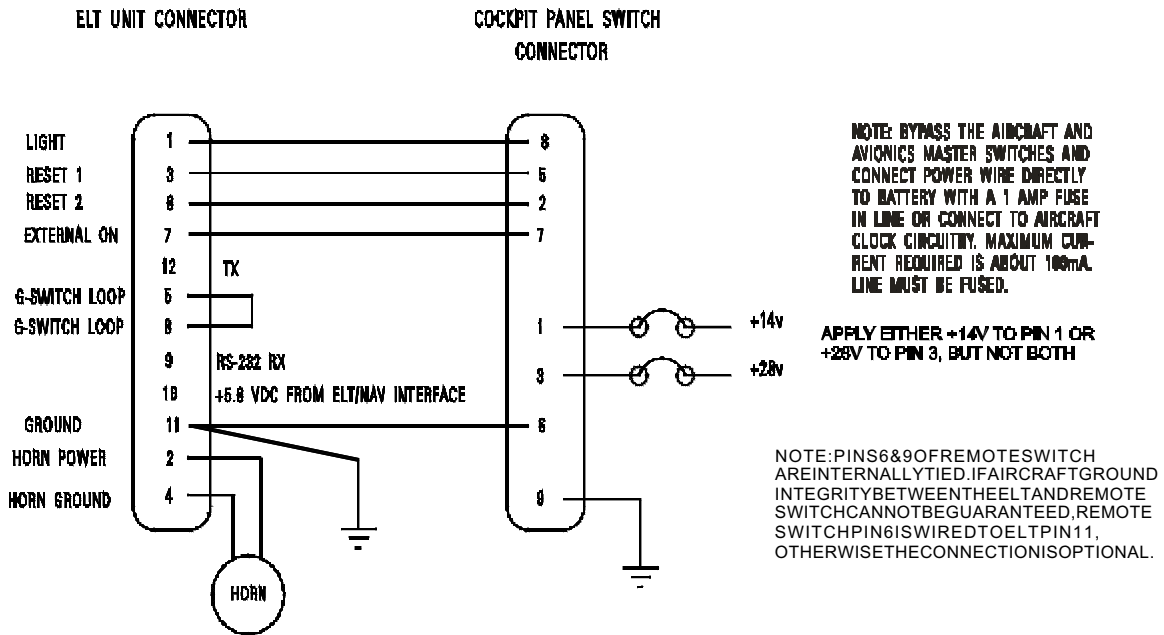
Strip about .150" of insulation from the ends of each of the 5 cable wires. Dress and tin the bare wires to prevent the strands from fraying during the crimp terminal installation.

Fabricate an additional wire long enough to reach from pin 11 of the ELT connector to an aircraft ground point. Strip and prepare as described above. This wire will be crimped in the same terminal as the wire running from pin 11 of the ELT connector to the cockpit remote switch (i.e. 2 wires terminated at the same point). Refer to the depiction of pin 11 on Figure 3-10. As an alternative, this wire may be spliced as described in AC 43.13-1A, Section 445 ("Splices in Electric Wire") if crimping both wires in a single terminal is not practical.

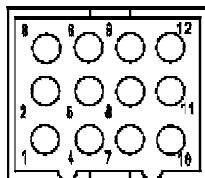
**Remember - the wires at the 12-pin connector end of the harness must be fed through the End Cap Assembly prior to installing the connector. Refer to Figure 3-9 and Section 3.6.2**

On one end of the cable, use a Molex crimp tool (Molex Tool # 11-01-0008) or equivalent tool for .062 terminal pins and crimp the male terminal pins provided (ARTEX P/N 151-6627) to each of the cable wires which will mate with the 12-pin receptacle which connects to the ELT. Remember, there will be 2 wires at pin 11. This end will join to the Molex connector on the ELT unit.

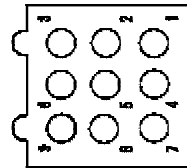
On the other end of the cable, crimp the female terminal pins provided (ARTEX P/N 151-6628), using Molex Tool (or equivalent) cited above, to each of the 5 cable wires. This end will join with the Molex connector on the cockpit panel switch assembly.



NOTE: USE 22 GAUGE WIRE MINIMUM.



PIN INSERTION VIEW OF MOLEX CONNECTOR FOR ELT UNIT. HOLE NUMBERING IS IDENTICAL TO THAT INSCRIBED ON ACTUAL CONNECTOR. ORIENTATION SHOWN IS SAME AS INSTALLATION ORIENTATION.



PIN INSERTION VIEW OF MOLEX CONNECTOR FOR COCKPIT SWITCH ASSEMBLY. HOLE NUMBERING IS IDENTICAL TO THAT INSCRIBED ON ACTUAL CONNECTOR. ORIENTATION SHOWN IS SAME AS INSERTION ORIENTATION FOR INSTALLED SWITCH.

FIGURE 3-10 WIRING DIAGRAM

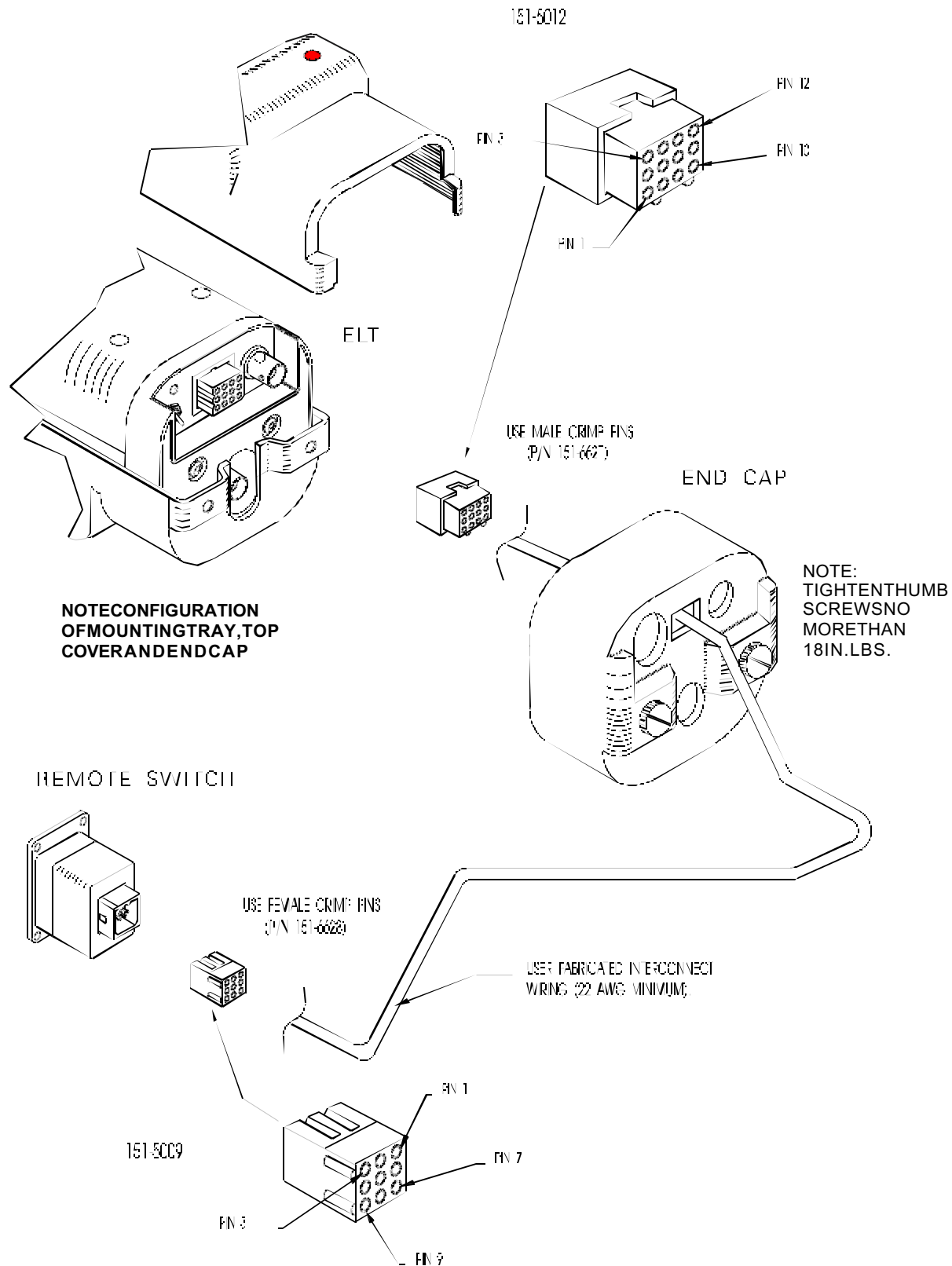
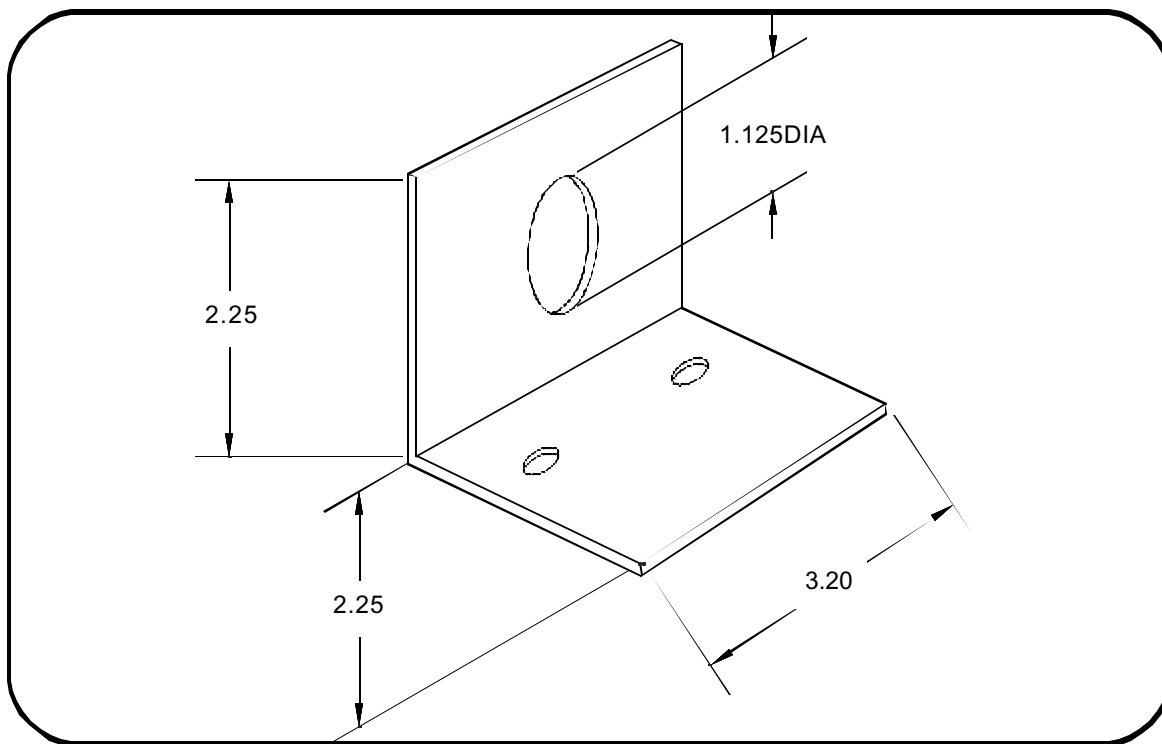


FIGURE 3-11 ELT-TO-REMOTE SWITCH INTERFACE DIAGRAM

**FIGURE 3-12 BUZZER BRACKET**

**For installations using ELT/NAV Interface:** Crimp a male terminal pin (ARTEX P/N 151-6627) to one end of each of the wires which will run to the ELT/NAV Interface unit (P/N 453-6500).

On the other end of each of the wires which run to the ELT/NAV Interface unit solder a connector pin (ARTEX P/N 151-2100) as described in the ELT/NAV Interface Installation and Operation Manual (570-4602).

NOTE: This cable may be connected now or after installing either the ELT or the front panel switch assembly. All wiring must be installed in accordance with AC 43.13-1A.

### 3.6.2. Connecting the ELT

Refer to Figures 3-9, 3-10 and 3-11

Feed the crimp terminated wires for the 12-pin connector through the rectangular hole in the mounting frame cap.

Fabricate a short jumper (about 1.5" long) and install male terminal pins on each end. Install the jumper between pins 5 and 8 in the 12-pin receptacle. Install the remaining wires into the 12-pin receptacle as shown in Figures 3-10 and 3-11. Push the connector into place inside the mounting tray cap. The mounting frame cap acts as a retainer for the connector once the cap is installed on the ELT.

Pin 1, as inscribed on the connector, must be in the lower left hand corner as shown in Figures 3-10 and 3-11.

### 3.6.3. Wiring Switch Assembly 9-pin Connector

Before inserting the cable pins into the 9-pin connector for the cockpit switch as -

sembly, strip and crimp a female terminal pin to a separate shorter wire for connection between pin 9 of the cockpit switch and aircraft ground. Strip and crimp a female pin to a second wire for connection between aircraft power and the applicable power connection (pin 1 or 3) on the cockpit switch connector.

Insert each of the female pins into the switch 9-pin connector, which will connect to the cockpit remote switch, as shown in the wiring diagram (Figure 3-10). Push the connector into place on the remote switch.

NOTE: Terminal pins may be removed by using Molex extraction tool #11-03-0002 or equivalent.

### 3.6.4. Power and Ground

The power source determines when the light functions but has no effect on the switch functions. It is preferable to bypass the aircraft and avionics master switches and connect the power wire directly to the battery with a 1 amp in-line fuse. A better solution is connecting to the aircraft clock circuitry.

If your ELT front panel indicator light is wired through either the aircraft master or the avionics master switch, make sure these switches are turned on during testing.

NOTE: If the aircraft does not have an electrical system (i.e. no battery), it is permissible to fabricate, using 3 alkaline 9 volt batteries in series, a substitute power source for the remote light. Connect the positive side of power source to the 28vdc pin of the remote switch. The alteration should be noted in the log book and the battery should be checked periodically and must be replaced every two years.

### 3.6.5. Finishing Up

With its switch in the "OFF" position (down), insert the ELT into the mounting tray at an angle so that the locking ears at the end opposite the direction-of-flight arrow fit into the mounting tray locking slots. Press the ELT down into the mounting tray until fully seated.

Install the protective top cover on the ELT by fitting the cover locking slots over the locking ears on the ELT. Push the cover toward the connector end of the ELT and seat it down in place on the ELT.

Insert the antenna coax cables through the end cap access holes and connect to the ELT unit. Connect the 12-pin Molex connector to the ELT unit. Slide the end cap into place over the mounting tray and protective top cover and secure the end cap to the mounting tray using the two thumbscrews.

Tie up excess slack in the coax cables, yet leave enough slack so that the mounting tray cap can be easily removed.

Perform the tests as outlined herein.

It is **VERY** important that the cockpit switch panel light immediately begins flashing continuously when the ELT is activated. If the light fails to start flashing immediately, recheck the interface wiring between the ELT and the cockpit panel switch.

Brief the operator(s) of the aircraft on the contents of this "ELT Installation and Operation Manual" and demonstrate the described tests. The manual should be kept either in the aircraft or with the aircraft logbooks.

Make the appropriate logbook entries and fill out and submit FAA Form 337.



**NOTE:** The TSO approval of the ELT does not constitute installation approval. All ELT installations are subject to field approval for a given airframe by either an approved FAA DER or FSDO. For installations outside of the US, contact your local civil aviation authority representative for details.

## **WARNING**

The signer of the FAA Form 337 is responsible for the accurate and complete installation of this ELT as defined previously.

Additional information regarding the completion of FAA Form 337 can be found in Advisory Circular AC 43.9-1E. Paragraph h (2) of this advisory circular defines what is considered to be approved data for major alterations as follows:

"Data used as a basis for approving major repairs or alterations for return to service must be FAA-approved prior to its use for that purpose and includes: FAR (e.g., airworthiness directives), AC's (e.g., AC 43.13-1A under certain circumstances), TSO's, parts manufacturing approval (PMA), FAA-approved manufacturer's instructions, kits and service handbooks, type certificate data sheets and aircraft specifications. Other forms of approved data would be those approved by a designated engineering representative (DER), a manufacturer holding a delegation option authorization (DOA), STC's and, with certain limitations, previous FAA field approvals. Supporting data such as stress analyses, test reports, sketches, or photographs should be submitted with the FAA Form 337. These supporting data will be returned to the applicant by the local FAA district office since only FAA Form 337 is retained as a part of the aircraft records at Oklahoma City."

### **3.6.6. Buzzer Installation**

A warning buzzer is required for TSO C126 approval. The buzzer (p/n 130-4004), is powered by the ELT unit and therefore is not dependent upon the aircraft battery for operation. It is not designed to operate continuously, but sounds at predetermined intervals, and runs for shorter periods toward the end of battery life.

While the buzzer may be located anywhere on the aircraft, it is recommended that the buzzer be placed near the ELT unit, as it is loud enough to be heard outside the aircraft when the engine(s) is (are) off. It is assumed that if the engine(s) is (are) running then the cockpit light will warn the pilot. Placing the buzzer in the cockpit is not recommended due to the very distracting, loud, siren-type sound it produces when the ELT is intentionally or inadvertently activated. Since the buzzer operates in tandem with the ELT cockpit switch panel light, it would only serve as a redundant warning indicator in the cockpit environment.

One way of mounting the buzzer is to fabricate a right angle bracket using .092 inch aluminum as shown in figure 3-12.

Wire the buzzer to the ELT as shown in the wiring diagram (Figure 3-10). Connect the positive (+) terminal to pin 2 of the ELT connector and the negative (-) terminal to ground.

### **3.7. Transmitter Test**

1. Always perform the tests within the first 5 minutes of the hour (UTC) as required by AC 43.13-1B, 12-21 & 12-22 Note 3. Be sure to notify any nearby control tower of your intentions.

## 2. WARNING!

**Do not allow test duration to exceed 5 seconds.** The ELT will transmit a 406.025 MHz signal after the ELT is active approximately 47 seconds, the satellite system considers the transmission to be a valid distress signal.

3. If your ELT front panel indicator light is wired through either the aircraft master or the avionics master switch, make sure these switches are turned on. **NOTE:** If the ELT is installed with an ELT/NAV Interface, ensure that both the Interface and the aircrafts navigational system are active at least 30 seconds prior to the ELT test.

4. Tune a receiver (usually the aircraft radio) to 121.5 MHz.

5. Turn the ELT aircraft panel switch to "ON," wait for 3 sweeps on the receiver, which takes about 1 second, and then turn the switch back to the "ARM" (OFF) position while paying special attention to the LED activity upon entering the "ARM" (OFF) condition.

The microprocessor in the ELT checks the G-switch (automatic activation switch) latching circuit, pins 5 & 8 on the 12-pin connector at the ELT; the 406.025 MHz transmitter for proper RF output; presence of valid navigation data (ELT/NAV Interface and navigation system must be active) and a battery check. If the ELT is working properly, the sequence following entry to the "ARMED" (OFF) condition will result in the panel LED staying ON for approximately 1 second then extinguishing.

If a problem is detected, the LED provides a coded signal following the initial 1 second pulse. The coded signal and related problem are as follows (the LED will flash in order of importance with approximately a .5 to 1 second pause between

each error code if multiple errors are present):

- a) 1 flash indicates a G-switch loop open failure.
- b) 3 flashes indicates a 406.025 MHz transmitter problem (i.e. bad or unconnected coax, antenna problem, low power output or a programming error).
- c) 5 flashes indicates there is no navigation data present. This is most likely due to improper wiring between the system interface connections, improper programming, invalid navigation data (navigation system not powered up) or an ELT/NAV Interface unit (453-6500) is not being utilized.
- d) 7 flashes indicates a battery problem (i.e. battery usage time over an hour).

There is a sequence to the problem reporting which is the same order as listed above. That is, if the G-switch circuit has a failure, there will be a single flash then 3 flashes would appear if there was a transmitter problem and so on.

**NOTE:** For installations using the ELT/NAV Interface, there is an error condition where the LED on the ELT and remote switch will flash rapidly. This occurs 2 minutes after power is applied to the ELT/NAV Interface if the ELT is not responding because either 1) the ELT is programmed for a protocol other than 24 bit and the ELT/NAV Interface has been strapped for a 24 bit address or 2) the RS-232 TX line from the ELT (pin 12) to the ELT/NAV Interface (pin 10) is not connected.

After initial installation, Artex recommends a monthly "self test" of the ELT by following the steps outlined in this section. Testing of the ELT in excess of once a month is not recommended as

the battery life will be shortened by excessive activations.

### 3.8. Sealing the ELT Connector

Once all tests have satisfactorily been completed and all harness connections have been verified to be correct, the connector at the ELT end of the ELT-to-Remote Cockpit Switch harness should be sealed to prevent moisture from getting into the wire entry holes. This can be done by applying an electronic grade, non-corrosive RTV (i.e. GE RTV 162) around the wires entering the rear of the 12-pin connector 151-5012 (refer to Figure 3-11).

Ensure each of the entry holes are filled with RTV. This will prevent water from beading up and causing possible bridging between connector pins which could result in false activation of the ELT.

### 3.9. Helicopter Installations

The primary consideration to remember is that RTCA 168 ("Minimum Performance Standards - Emergency Locator Transmitters") paragraph 2.3.1 states that the primary sensor (Delta V switch in the case of the ARTEX ELTs) is intended to respond to crash accelerations parallel to or coincidental with the longitudinal axis of the aircraft, moving generally in a forward direction.

There are few guidelines, aside from experience, as to the best way to install an ELT in a helicopter. The manufacturers have traditionally advised installing the ELT at a 45 degree angle relative to the longitudinal plane of the helicopter. This

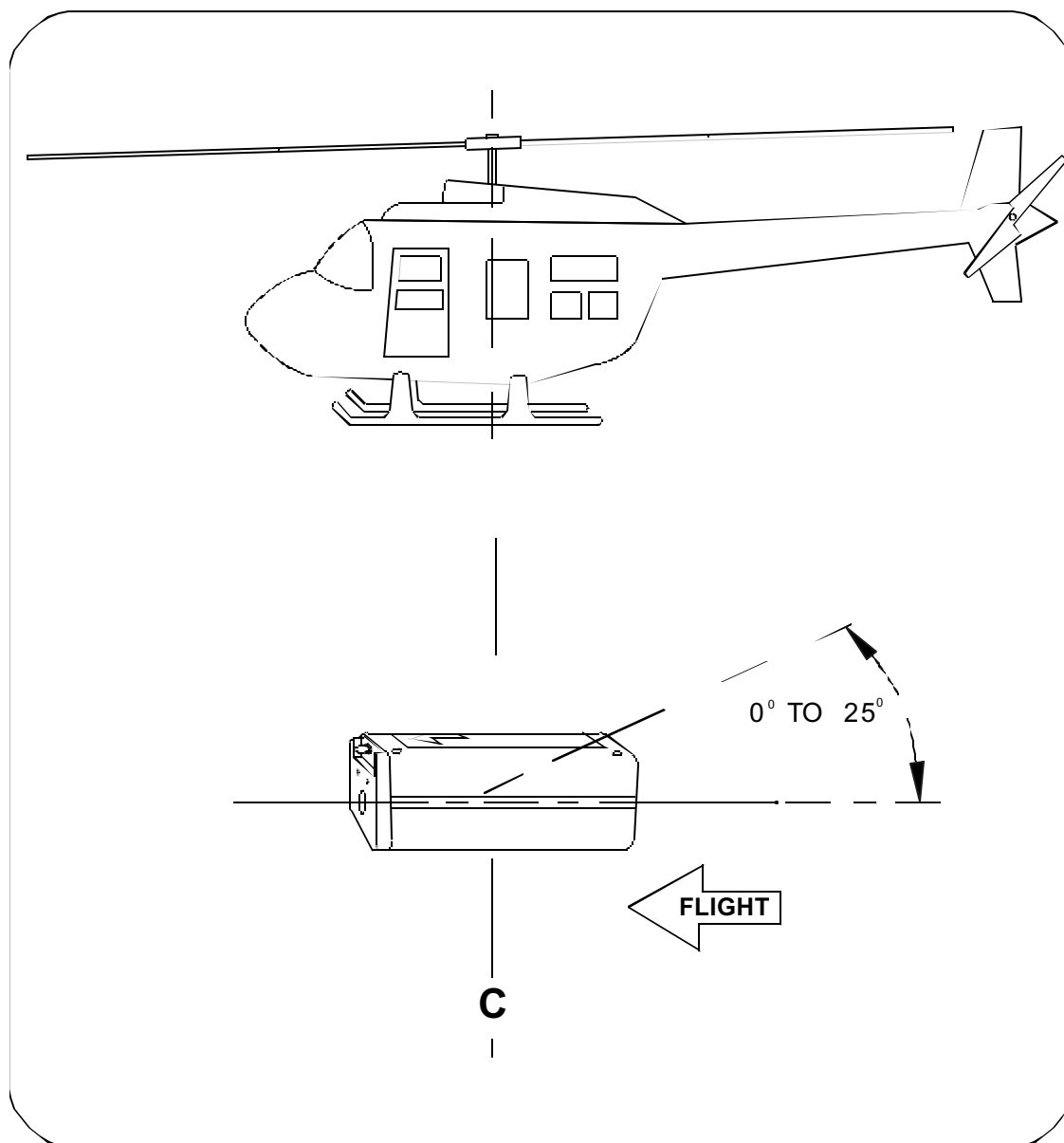
was assumed to be the best mounting position given the unique flight characteristics of helicopters.

Experience has shown, however, that the mounting angle tends to preload the G force level on the G-switch. The Delta V switch is required by TSO C91a to be far more sensitive and activate at a significantly lower sustained G force than older TSO C91 ELTs. ARTEX has found that in many cases the 45 degree mounting angle can result in false activation of the ELT depending on the type and severity of the aircraft maneuvers. The same can be true of abrupt takeoffs and landings.

While the C406-2 may be installed in a helicopter **Artex highly recommends use of the C406-2HM for helicopter installations**. These ELT's were especially designed for rotary aircraft and contain an additional five G-Switch module in addition to the primary crash sensor. This feature allows for six axes of coverage.

ARTEX recommends that when installing a C406 series ELT whenever possible, the ELT should be mounted parallel with the floor as shown in Figure 3-13. If space constraints do not permit mounting the ELT parallel with the floor, the ELT may be tilted forward as much as 25 degrees. The direction of flight arrow on the ELT's product label represents the direction in which the primary crash sensor is oriented.

**NOTE:** Installation in a pressurized aircraft constitutes a major modification, consult the Department of Transportation Regional Officer before proceeding.

**FIGURE 3-13 ELT HELICOPTER INSTALLATION**

# PERIODIC MAINTENANCE

## 4.1. In the United States

**WHY?** To ensure continued reliability of your ELT it must be inspected for damage and wear which could be caused by age, exposed elements, vibrations, etc. Even the best designed equipment, if not properly maintained and cared for, will eventually fail.

**HOW OFTEN?** At least once every year, unless required more frequently by FARs (e.g., 100 hour inspections)

**IS IT REQUIRED?** FAR Parts 91.207, 91.409 and 43 Appendix D make detailed ELT inspections mandatory.

**HOW DETAILED?** FAR 43, Appendix D(i) states in part that each person performing an annual or 100-hour inspection shall inspect the following components of (the ELT):

- (1) (ELT unit and mount) for improper installation and insecure mounting.
- (2) Wiring and conduits - for improper routing, insecure mounting, and obvious defects.
- (3) Bonding and shielding - for improper installation and poor condition.
- (4) Antenna, including trailing antenna-for poor condition, insecure mounting, and improper operation.

## 4.2. In Canada

**WHY?** To ensure continued reliability of your ELT it must be inspected for damage and wear which could be caused by age, exposed elements, vibration, etc. Even the best designed equipment, if not properly maintained and cared for, will eventually fail.

**HOW OFTEN?** The ELT must be "performance tested within the 12 month period preceding installation in an aircraft and within 12 month intervals thereafter..."

**IS IT REQUIRED?** Yes. For Canadian installations, all maintenance shall be performed in accordance with CAR's Part V, Subpart 71 and Part VI, Subpart 5.

**HOW DETAILED?** The same reference quoted above states five essential tests:

- (1) The measured peak power after 3 minutes of operation;
- (2) The measured frequency after 3 minutes of operation;
- (3) The audio modulation, which shall be recognizable as a typical ELT signal;
- (4) The measured current draw in the "OFF" (ARM) position and in the "ON" position as specified by the ELT manufacturer; and
- (5) The automatic activation system.

## 4.3. Periodic Maintenance Inspection Procedure

To comply with the above quoted FAA & Canadian DOT regulations, ARTEX Aircraft Supplies provides the following maintenance procedures (see Figure 4-1 "Periodic Maintenance Inspection Check list"). These procedures include checks which are mandatory in Canada. FAR 91.207(d) states those inspection checks required in the United States. In addition to the maintenance checks described in this chapter a monthly "self test" of the ELT is recommended. Please refer to Section 3, page 3-17 of this manual for more information.

**STEPS 5a THROUGH 5i ARE MANDATORY IN CANADA**

- |  |                          |
|--|--------------------------|
| STEP 1 - Remove Coaxial and Wiring Connections and Inspect.....  | <input type="checkbox"/> |
| STEP 2 - Remove ELT and Inspect Mounting Hardware.....           | <input type="checkbox"/> |
| STEP 3a - Remove ELT Battery Pack and Inspect.....               | <input type="checkbox"/> |
| STEP 3b - Replace/Reinstall Battery Pack.....                    | <input type="checkbox"/> |
| STEP 4 - Activate Using "Football Throw" Method: Then Reset..... | <input type="checkbox"/> |
| STEP 5a - Activate ELT in Attenuating Container.....             | <input type="checkbox"/> |
| STEP 5b - Measure 121.5 & 243.0 MHz Power Output.....            | <input type="checkbox"/> |
| STEP 5c - Measure 121.5 MHz ELT Frequency.....                   | <input type="checkbox"/> |
| STEP 5d - Listen to the Audio Modulation.....                    | <input type="checkbox"/> |
| STEP 5e - Measure 406.025 MHz Power Output.....                  | <input type="checkbox"/> |
| STEP 5f - Measure 406.025 MHz Frequency.....                     | <input type="checkbox"/> |
| STEP 5g - Current Draw Tests.....                                | <input type="checkbox"/> |
| STEP 5h - Verification of Digital Message.....                   | <input type="checkbox"/> |
| STEP 5i - "Reset" ELT.....                                       | <input type="checkbox"/> |
| STEP 6 - Reinstall ELT.....                                      | <input type="checkbox"/> |
| STEP 7 - Perform Transmitter Tests.....                          | <input type="checkbox"/> |
| STEP 8 - Perform Antenna Tests.....                              | <input type="checkbox"/> |
| STEP 9 - Logbook Entry.....                                      | <input type="checkbox"/> |

NOTE: FAR 91.207(d) requires that the ELT be inspected within 12 calendar months after the last inspection for -

1. Proper installation
2. Battery corrosion
3. Operation of controls and crash sensor
4. The presence of a sufficient signal radiated from its antenna (See 4.3.17 [Step 8] Antenna Test)

**FIGURE 4-1 PERIODIC MAINTENANCE CHECKLIST**

Note: the step numbers (i.e. Step 1, Step 2, etc.) which follow correspond to those listed in Figure 4-1.

#### 4.3.1 (Step 1) Remove ELT Connections

Loosen the thumbscrews on the end cap. Pull the end cap away from the ELT. Lift up the Protective Top Cover and push away from the connector end of the ELT to remove. Lay Protective Top Cover aside. Remove all interconnections to the ELT unit and ELT antenna. Visually inspect and confirm proper seating of all connector pins. Special attention should be given to coaxial center conductor pins which are prone to retracting into the connector housing.

#### 4.3.2 (Step 2) Remove ELT

Lift the ELT up from the connector end (careful use of a flat blade screw driver as a lever makes this step easier) to remove the ELT unit from its mounting tray. Inspect the mounting hardware. Ensure the hardware is free of cracks or other obvious damage. All required mounting hardware should be installed and secured and must meet the integrity requirements as defined herein.

##### CAUTION:

Do not use **contact cleaner** on ELT components. Such chemical agents can be highly destructive to the mounting hardware and ELT housing, causing cracking, fracturing and breakage.

#### 4.3.3 (Step 3a) Remove Battery Pack

**NOTE:** The battery pack contains static sensitive parts, take ESD precautions before handling.

**tions before handling.** Remove the four screws from the battery pack. Before proceeding further, read the following advisory to avoid damage to the ELT. For detailed instructions refer to Section 4.5 and Figure 4-4.

**WARNING:** The battery pack is connected to the ELT via short interconnect harnesses which limit the distance of separation between the two components prior to disconnecting the harnesses. Proceed as follows:

- Lay the ELT on its side.
- Carefully lift the battery pack away from the ELT and lay along side the ELT unit.
- Carefully disconnect the harness from the 8-pin connector on the small circuit board in the battery pack. Do not short connector pins.
- Disconnect 2-pin harness from the ELT body.

Inspect the battery pack and the underside of the ELT. The battery cells, components and connectors should be free of corrosion. The underside of the ELT should be corrosion free. Inspect for any broken wires or connections. Ensure the battery housing is free of cracks or other visible damage.

Verify the battery expiration date. If the battery pack has not expired it may be reinstalled. However, for optimum performance, it is recommended that the battery be replaced if the voltage under load is less than 12.0 vdc. The battery pack must be replaced with a new one:

- After use in an emergency;
- After an inadvertent activation of unknown duration;
- When the total of all known transmissions exceeds one hour;



- On or before the battery replacement (expiration) date.

#### 4.3.4 (Step 3b) Replace/Reinstall Battery Pack

To replace/reinstall the battery pack, connect the 8-pin connector to the header on the circuit board in the battery pack. Connect the 2-pin power harness to the ELT. This step will cause the ELT to activate. Reset the ELT by toggling the "ON/OFF" switch on the ELT from "ON" to "OFF".

Fit the battery pack into place dressing wires away from the standoffs to avoid pinching wires between standoffs and battery pack. Install two screws diagonally from each other to secure battery pack during the tests that follow.

**Note:** If the check-out is going to conclude with Step 4 below, then reseal the battery pack on the ELT, dressing the harness wires away from the standoffs to avoid pinching the wires between the battery pack and the standoffs. Reinstall the four Phillips head screws and tighten securely. Do not over torque the screws.

#### 4.3.5 (Step 4) G-Switch Check

**NOTE:** The ELT cannot be activated this way unless pins 5 and 8 are jumpered (this happens automatically when the unit is locked into the mounting tray with the connector in place). Because of the potential physical damage which could occur through an improper jumper, it is recommended that this step be performed only by an experienced technician/mechanic. See "Installation" section of this manual for pin layout diagram. A test plug may be obtained from ARTEX (p/n 151-2012) to use in performing this test.

While monitoring 121.5 MHz on an AM receiver, and with the unit switch in the

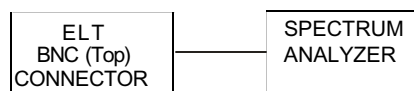
"OFF" (down) position, activate the ELT by using a rapid forward (throwing) motion, in the direction of the arrow, followed by a rapid reversing action. Verify activation via the aural swept tone on the receiver. Following activation, "RESET" the unit by toggling the "ON/OFF" switch to "ON" then back to "OFF".

#### 4.3.6 (Step 5a) Electrical Check

Activate the ELT. As the unit will be on for three minutes it is recommended that it be placed in a container capable of substantially attenuating RF signals. Remember that all tests must be performed within the first five minutes after the hour UTC (Universal Coordinated Time). Monitor the following performance criteria for three minutes (power output must be made at the end of the three minute period).

#### 4.3.7 (Step 5b) 121.5/243 MHz Power Output

Connect the equipment as shown below:



Note: use a fresh battery pack (12.5 volts nominal) or a 4 amp, 12.5 vdc power supply as power source.

The test equipment specified in the following steps is only a recommendation. The use of other manufacturer's models of test equipment capable of providing equivalent measurement results is acceptable.

Set the Spectrum Analyzer as follows:

- Center Freq: 121.5MHz
- Span: 1 MHz
- Resolution Bandwidth: 1 MHz

- Vertical Display: 10 dB/Div
- Sweep: Auto
- Peak/Avg: Peak
- Reference Level: 30 dBm
- Time/Div: 20ms

Adjust the reference amplitude to place the peak of the carrier slightly above the top graticule line.

Enable the "fine" amplitude adjustment. Set the carrier peak to exactly the top of the reference line.

Read the displayed amplitude.

Repeat for the 243.0 MHz harmonic (Change the "Center Frequency" to 243.0 MHz. All other settings remain the same).

The minimum allowed amplitude on 121.5 MHz and 243.0 MHz is 23 dBm (200 mW).

#### 4.3.8 (Step 5c) 121.5 MHz Frequency

The ELT transmitter frequency may be measured as follows:

Connect the frequency counter as shown below:



If the 121.5 MHz carrier frequency is within specified parameters, the 243.0 MHz frequency will also be within specified parameters.

The ELT should be within 50 ppm (+/- 6.075KHz) of 121.500000 MHz.

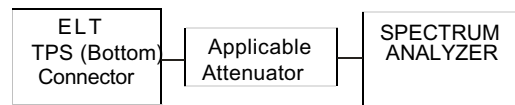
#### 4.3.9 (Step 5d) Audio Modulation

During the swept tone portions the audio should "sound" like an ELT. Set the unit switch to the "OFF" position.

#### 4.3.10 (Step 5e) Measure 406.025 MHz Power

Note: the power output is approximately 37 dBm @ 5 Watts. Ensure adequate attenuation is inserted in-line between the ELT's 406.025 MHz output and the input to the spectrum analyzer to protect the analyzer's input circuitry.

Connect the equipment as shown below:



Set the Spectrum Analyzer as follows:

- Center Freq: 406.025 MHz
- Span: 1 MHz
- Resolution Bandwidth: 1 MHz
- Vertical Display: 10dB/Div
- Sweep: Auto
- Peak/Avg: Peak
- Reference Level: 30 dBm
- Time/Div: 20ms
- Max Hold: On
- Attenuator(as required) on Input

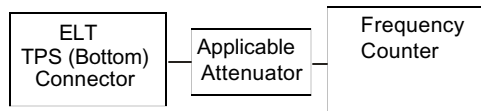
Turn the ELT on and wait approximately 50 seconds for the 406.025 MHz transmitter to turn on (transmitter sends out first signal at 50 seconds then every 50 seconds thereafter). Determine the power output from the stored waveform. The 406.025 MHz power output should

be 37 dBm +/- 2 dBm (3.16 W min to 7.94 W max).

#### 4.3.11 (Step 5f) Measure the 406.025 MHz Frequency

Ensure that adequate attenuation rated for 406.025 MHz, 37 dBm and 5 Watts is installed between the ELT's 406.025 MHz output and the input to the frequency counter to prevent damaging the frequency counter's input circuitry.

Set up the equipment as shown below:



Verify an initial frequency of 406.025 MHz +/- 2 KHz.

**NOTE:** Allow the unit to run 30 seconds before making the measurement to allow the oscillator to stabilize.

#### 4.3.12 (Step 5g) Current Draw Tests

**CAUTION:** The following tests involve measurements of the lithium battery pack. Exercise extreme caution to avoid causing a short circuit condition which will blow the fuses on the battery pack. It is recommended that only an experienced technician perform these tests.

A test harness (p/n 611-0024) may be ordered from ARTEX Aircraft Supplies at 1-800-547-8901.

All tests must be performed in an RF screen room or with the ELT in a shield-ed container that will substantially attenuate the RF signal.

All "ON" state current measurements must be made with the RF outputs load-ed with 50 ohms rated for 5 Watts (either a resistive load or equipment with 50 ohm impedance padded with 10 dB/ 5 Watt attenuator, i.e. a spectrum analyzer).

**NOTE:** The ELT may activate (turn "ON") when the various connections are initially made during the following current tests. This is normal. Reset the unit to "OFF" ,if this happens, by toggling the ON/OFF switch to "ON" and back to "OFF".

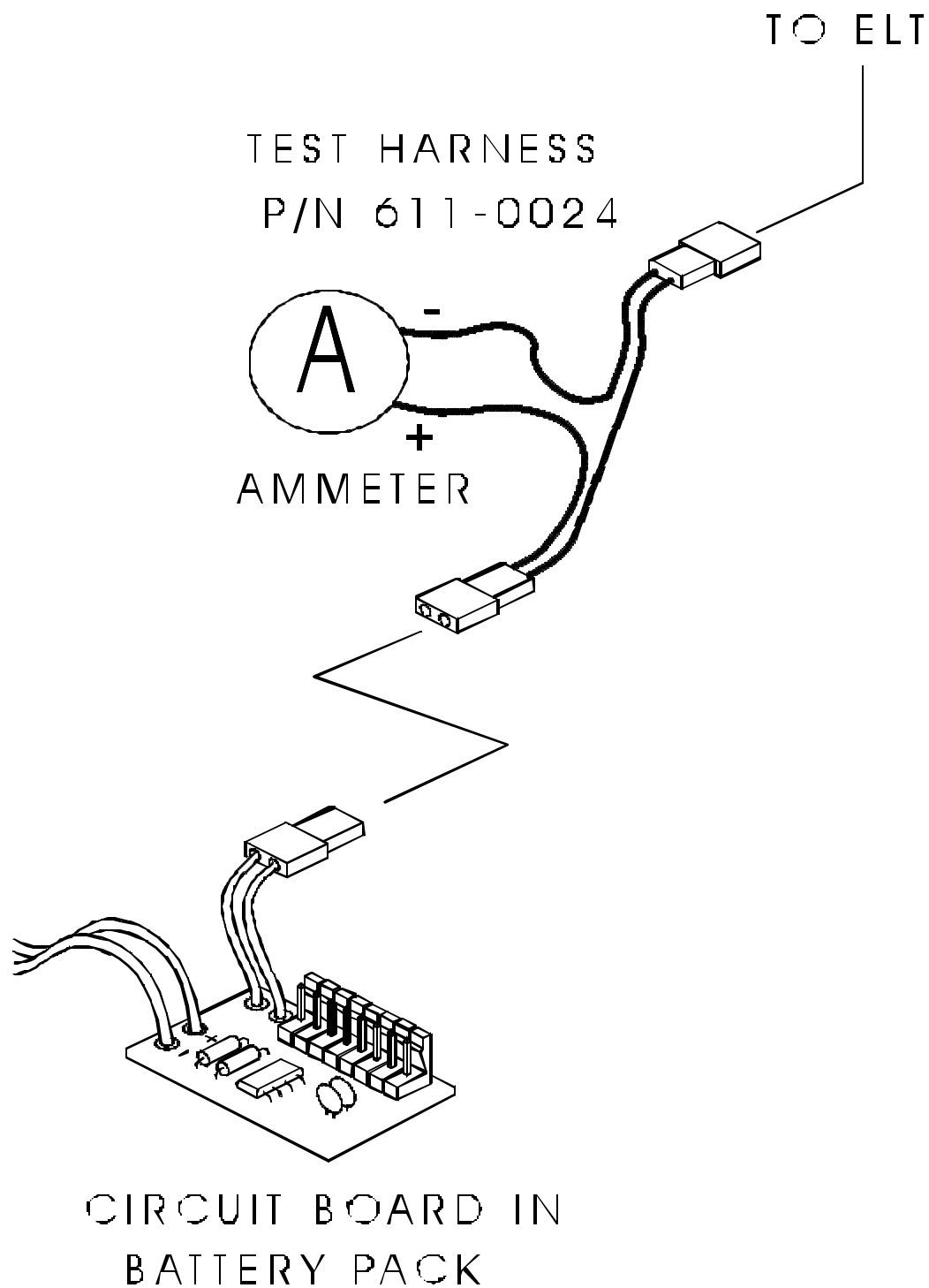
#### "ARM" ("OFF") State Current Measurement:

- Re move the bat tery pack as de scribed in Sec tion 4.3.3
- Dis con nect the 2-pin har ness
- In stall the test har ness 611-0024 and an in- line am me ter as shown in Fig ure 4-2
- En sure the ELT is "OFF".
- Mea sure the cur rent with the am me ter. The mea sured cur rent should be 0 microamps (uA) and not more than 6 uA.

#### "ON" State Current Measure-ment:

**NOTE:** Current draw during this test may ex ceed **3.5 Amps** during the 406.025 MHz burst. Ensure the ammeter is set on the appropriate range to ac-commodate this level of current.

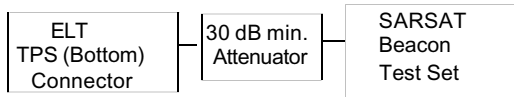
- Acti vate the ELT, al low to sta bi lize.
- The mea sured steady state cur rent should not ex ceed 200 milliamps (mA). When the 406.025 MHz mod ule is on (gen er at ing the 406.025 MHz burst) the cur rent may ex ceed 3.5 Amps.

**FIGURE 4-2 TEST HARNESS CONNECTION**

- Turn the ELT "OFF".
- Disconnect the test harness 611-0024.
- Reconnect the 2-pin module power harness.
- Reinstall the battery pack as described in Section 4.3.4

### 4.3.13 (Step 5h) Verification of Digital Message

Set up the equipment as shown below:



**NOTE:** If checking the latitude/longitude, ensure that the aircraft's navigation system and ELT/NAV Interface are connected and powered on at least 30 seconds prior to activation of the ELT.

Activate the ELT and allow the ELT to transmit 15 to 30 seconds but not more than 40 seconds. The SARSAT Beacon Tester will receive the "test message" transmitted at turn off. If the 406.025 MHz oscillator is not warmed up and stabilized, a "BAD FRAME" message may occur, which could be construed as a problem when, in fact, the message was generated because the oscillator had not warmed up. If a "BAD FRAME" is received, repeat the activation and turn off procedure again. For all testing of the 406 MHz output, only the "test message" that is transmitted at turn off is required to verify the ELT and ELT/NAV Interface function. The test message contains all the information contained in the actual distress message except there is a special digital test prefix that tells the COSPAS/SARSAT satellites to ignore the message.

Note: The initial display on the SARSAT Beacon Test Set can flag several prob-

lems prior to advancing into the individual Page displays described later.

a) if a "BAD FRAME" message appears after the 3rd or 4th transmit attempt, the Beacon Test Set is not receiving transmit data. Verify that the SARSAT Beacon Test Set does not have a low battery. Check the coax connection between the ELT's TPS connector and the SARSAT Beacon Test Set. Check the internal ELT coax connection between the TPS connector and the 406.025 MHz module. Finally, try a different battery pack.

b) if a "S' TEST BAD" or "DATA ERROR" message appears, there is a problem with the ELT (i.e. a programming problem or a problem with the transmitter module) or the battery pack.

c) if there is no 406.025 MHz transmitter burst present, check the 3.0 Amp fuse on the circuit board in the battery pack for an open condition. If the fuse is good, there is most likely a problem with the 406.025 MHz module or its interconnections.

### 24 Bit Address Protocol (Long Message)

Refer to Figure 4-3A and 4-3B for the Beacon Test Set display contents of each specific page described below.

**Page 1** is the main menu screen. Press "V" for view to see received message or scroll using "up" and "down" arrow keys to view other messages. Use "left" and "right" arrow keys to scroll between pages.

**Page 2** contains the Date and Time that the message was received. Also included is an indication of whether the message was received properly. Verify that the third or bottom line reads "S' TEST OK".

## PAGE 1 (MENU OPTIONS)

SARSAT BEACON TESTER		
Rec v	View	Quit
Erase	Setup	Output

NOTE: The example pages shown represent the long message format with 24 bit protocol. Serialized protocol and other possible formats are not shown.

## PAGE 2 (VIEW MODE)

↑ ↓ ← → F L Q	EP
Mes g #1	Received At
7:10:30	13 FEB 1999
S' TEST OK	

VERIFY MESSAGE  
RECEIVED "S' TEST OK"

## PAGE 3 (VIEW MODE)

↑ ↓ ← → F L Q	EP
Mes g #1	Frequency:
406.025 MHz	PASS
COUNTRY:	366 USA

VERIFY FREQUENCY AND  
COUNTRY CODE

## PAGE 4 (VIEW MODE)

↑ ↓ ← → F L Q	EP
Mes g #1	96E3 ADA9A5
7FDFFC7883F583E0FAA8	
ID:2DC75B534AFFBFF	

VERIFY HEX CODE ID:  
2DC75B534AFFBFF

## PAGE 5 (VIEW MODE)

↑ ↓ ← → F L Q	EP
Mes g #1	STD LOC
ELT + EXT GPS	
AIRCRAFT # ADA9A5	

VERIFY AIRCRAFT  
ID ADA9A5

**FIGURE 4-3A BEACON TEST SET DISPLAYS**

PAGE 6 (VIEW MODE)

↑	↓	←	→	F	L	Q	EP
Mes g #1				STD LOC			
Hom ing: 121.5 MHz							
BCH: 19A1D7 VALID							

VERIFY HOMING FREQUENCY

PAGE 7 (VIEW MODE)

↑	↓	←	→	F	L	Q	EP
Me sg #1				Othe r info:			
Long Mesg.							

VERIFY LONG MESSAGE

PAGE 8 (VIEW MODE)

↑	↓	←	→	F	L	Q	EP
Mes g #1				Other info:			
Lat : 45N23.4							
Long: 122W15.1							

VERIFY LATITUDE AND LONGI-  
TUDE OF 45DEGREES 23.4 MIN-  
UTES NORTH, 122 DEGREES 15.1  
MINUTES WEST

PAGE 9 (MENU OPTIONS)

SARSAT BEACON TESTER		
Recv	View	Quit
Erase	Setup	Output

PRESS "Q" TO RETURN TO  
MAIN SCREEN PAGE

FIGURE 4-3B BEACON TEST SET DISPLAYS

**Page 3** is a frequency and country code page. The frequency must read between 406.030 and 406.020 MHz to pass. The programmed country code must be the same country as the aircraft's home base. Verify that the second line of the display reads "PASS". Verify that the country code is the same as the aircraft's home base.

**Page 4** contains the complete message in Hexadecimal notation. The third line is an ID string that is unique to the beacon being tested. Verify that ID string on the third line matches the ID printed on the product label of the 406 ELT. **NOTE:** For ELT's installed with an ELT/NAV Interface where the Interface is used to encode the 24 bit aircraft address, the ELT will be automatically re-programmed by the Interface and will need to be re-labeled with the new 15 digit hex ID string.

**Page 5** describes the protocol type, the type of beacon, and the aircraft ID or unit serial number. Verify that the aircraft ID matches the 24 bit address of the aircraft (you will need to convert the aircraft's Octal code to Hex).

**Page 6** contains information on the homing transmitter and error checking.

**Page 7** contains information confirming that the long message (position data) is present.

**Page 8** contains the position data as received from the navigation system. Verify that the position data is present for latitude and longitude if using ELT/NAV Interface.

**Page 9** is the main menu screen which is reached by pressing "Q".

#### **Serialized Protocol (Long Message)**

For ELT's that are programmed with serialized protocol verify that "S' TEST OK"

is displayed on Page 2, verify on Page 3 that the frequency passes and that the correct country is displayed. Verify that the 15 digit hex code displayed on the bottom line of Page 4 matches the 15 digit hex code printed on the ELT product label. If verifying received latitude/longitude, check Page 8. All other information displayed may be disregarded.

#### **Short Message Programmed ELT's**

For ELT's that have been programmed for a Short Message protocol verify that "S' TEST OK" is displayed on Page 2, verify on Page 3 that the frequency passes and that the correct country is displayed. Verify that the 15 digit hex code displayed on the bottom line of Page 4 matches the 15 digit hex code printed on the ELT product label. All other information displayed may be disregarded.

**NOTE:** Contact your local Artex dealer for availability of Portable SARSAT Beacon Test Sets (ARTEX p/n 453-0131) or call Artex direct at 1-800-547-8901.

#### **4.3.14 (Step 5i) Reset ELT**

To "RESET" the ELT, move the switch to the "ON" position then back to the "OFF" position.

#### **4.3.15 Step 6 Reinstall ELT**

Reinstall the ELT into aircraft as follows:

Insert the ELT into the mounting tray at an angle so that the locking ears at the end opposite the direction-of-flight arrow fit into the mounting tray locking slots. Fit the protective top cover onto the ELT. Ensure that the slots at the end of cover fit over the locking ears on the ELT prior to fitting cover into place at the connector end. Feed the two coax cables through the holes in the end cap and connect them to their respective con-



nections on the ELT. Position the end cap and connector assembly onto the ELT and tighten the two thumbscrews securely. Visually inspect connections ensuring that they are seated properly.

#### 4.3.16 (Step 7) Installed Transmitter Test (Self Test)

Perform the transmitter tests by activating the ELT and listening on 121.5 MHz. Be sure to follow the procedures as outlined under "Transmitter Test" in Section 3, page 3-17 of this manual.

- If your ELT front panel indicator light is wired through either the aircraft master or the avionics master switch, make sure these switches are turned on.
- Tune a receiver (usually the aircraft radio) to 121.5 MHz.
- Turn the ELT aircraft panel switch to "ON", wait for 3 sweeps on the receiver, which takes about 1 second, and then turn the switch back to the "ARM" (OFF) position while paying special attention of the LED activity upon entering the "ARM" (OFF) condition.

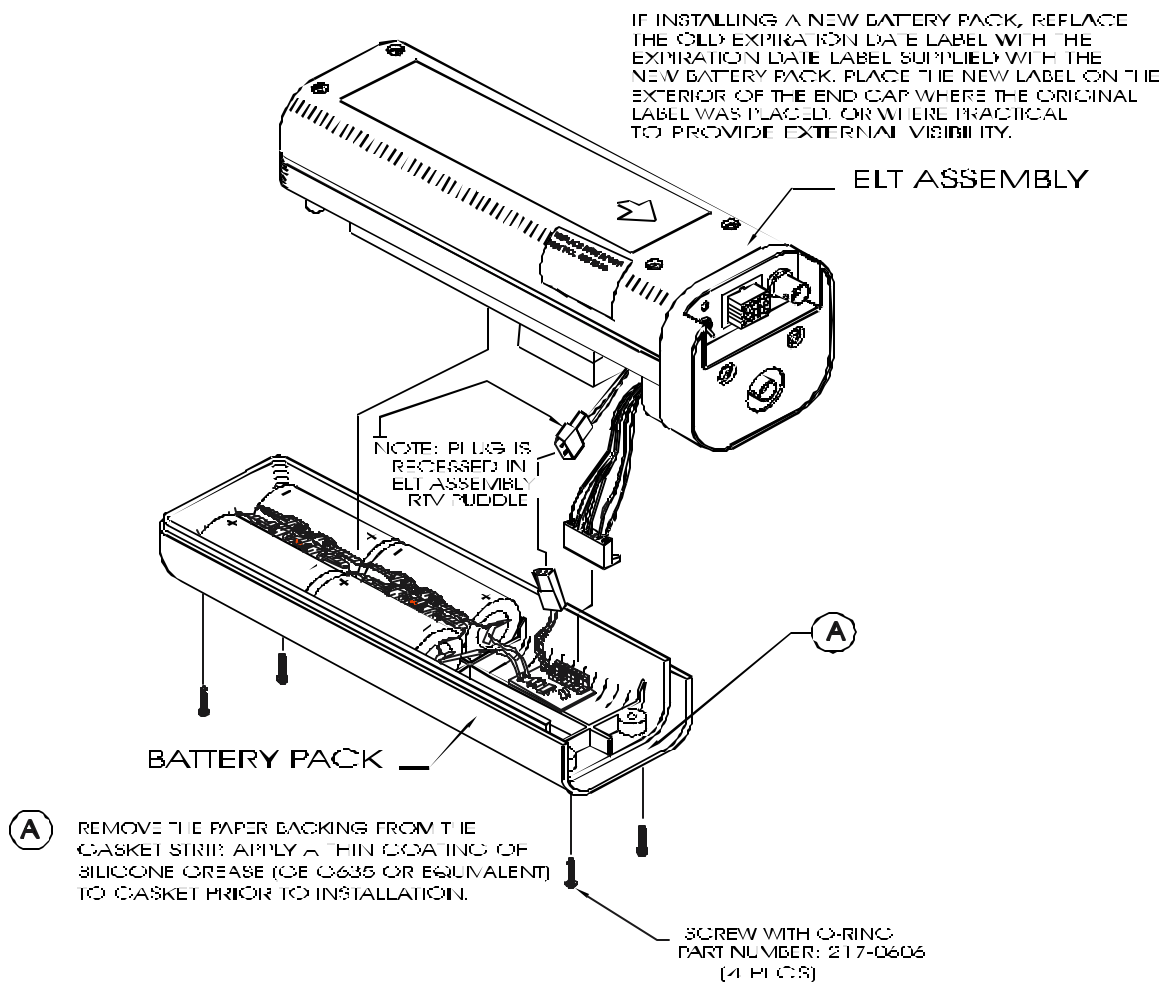
To pass the test, you must hear the 3 sweeps AND see the front panel light immediately begin to flash continuously. During the ON to OFF transition, the microprocessor in the ELT checks the "G-Switch" (automatic activation switch) latching circuit, pins 5 & 8 on the 12-pin connector at the ELT; the 406.025 MHz transmitter for proper RF output; that position data is present and a battery check. If the ELT is working properly, the sequence following entry to the "ARMED" (OFF) condition will result in the panel LED staying illuminated for approximately 1 second, then extinguishing.

If a problem is detected, the LED provides a coded signal following the initial 1 second pulse. The coded signal and related problem are as follows:

- a) 1 flash indicates a G-switch loop open failure.
- b) 3 flashes indicates a 406.025 MHz transmitter problem (i.e. bad or unconnected coax cable, an antenna problem, low power output or a programming error).
- c) 5 flashes indicates there is no navigation data present. This is most likely due to improper wiring between the system interface connections, improper programming, invalid navigation data or an ELT/NAV Interface unit (453-6500) is not being utilized.
- d) 7 flashes indicates a battery problem (i.e. battery usage time over an hour).

There is a sequence assigned to the problem report which is the same order as listed above. If the G-switch circuit has a failure, there will be a single flash. If there also is a 406.025 MHz transmitter problem then after the single flash and a 1 second pause, 3 flashes would appear.

**NOTE:** For installations using the ELT/NAV Interface, there is an error condition where the LED on the ELT and remote switch will flash rapidly. This occurs 2 minutes after power is applied to the ELT/NAV Interface if the ELT is not responding because either 1) the ELT is programmed for a protocol other than 24 bit and the ELT/NAV Interface has been strapped for a 24 bit address or 2) the RS-232 TX line from the ELT (pin 12) to the ELT/NAV Interface (pin 10) is not connected.

**FIGURE 4-4 ELT/BATTERY PACK EXPLODED VIEW**

#### 4.3.17 (Step 8) Antenna Test

Action Notice A 8150.3 advises that:

"A low quality AM broadcast receiver should be used to determine if energy is being transmitted from the antenna. When the antenna of the radio (tuning dial on any setting) is held about 6 inches from the activated ELT antenna, the ELT aural tone will be heard on the AM broadcast receiver. This is not a measured check, but it does provide confidence that the antenna is radiating sufficient power to aid search and rescue. The aircraft's VHF receiver, tuned to 121.5 MHz, may also be used. This receiver, however, is more sensitive and could pick up a weak signal even if the radiating ELT's antenna is disconnected. Thus it does not check the integrity of the ELT system or provide the same level of confidence as does an AM radio."

#### 4.3.18 (Step 9) Logbook Entry

Enter the date the test technician's initials and whether the ELT passed or failed into the aircraft's logbook.

### 4.4. Summary of Minimum Requirements

#### 4.4.1 Specifications @ 121.5 MHz

- Frequency: 121.5 MHz
- Frequency Tolerance: +/- 6.075 KHz
- Modulation: AM
- Power Output:  $\geq 23.0$  dBm

#### 4.4.2 Specifications @ 243.0 MHz

- Frequency: 243.0 MHz
- Frequency Tolerance: +/- 12.15 KHz
- Modulation: AM

- Power Output:  $\geq 23.0$  dBm

#### 4.4.3 Specifications @ 406.025 MHz

- Frequency: 406.025 MHz
- Frequency Tolerance: +/- 2 KHz
- Modulation: Bi-phase L
- Power Output: 37.0 dBm +/- 2 dBm

#### 4.4.4 Transmitter Test

Perform the transmitter tests by activating the ELT and listening on 121.5 MHz.

An amplitude modulation (AM) broadcast radio receiver should be used to determine if energy is being transmitted from the antenna (see section 4.3.17).

**NOTE:** All ELT "ON" tests should be performed within the first five minutes after the hour UTC.

### 4.5. ELT Battery Pack Replacement

**NOTE:** The battery pack contains static sensitive parts, take ESD precautions before handling. Remove the four screws from the battery pack. Before proceeding further, read the following advisory to avoid damage to the ELT. Also refer to Figure 4-4.

**WARNING:** The battery pack is connected to the ELT via short interconnect harnesses which limit the distance of separation between the two components prior to disconnecting the harnesses. Proceed as follows:

- Lay the ELT on its side.
- Carefully lift the battery pack away from the ELT and lay along side the ELT unit.

- Carefully disconnect the harness from the 8-pin connector on the small circuit board in the battery pack. Do not short connector pins.
- Disconnect 2-pin harness.

Inspect the battery pack and underside of ELT. Battery cells, components and connectors should be corrosion free. The underside of ELT should be corrosion free. Inspect for any broken wires or connections. Ensure the battery housing is free of cracks or other visible damage.

The battery pack must be replaced with a new one:

- After use in an emergency;
- After an inadvertent activation of unknown duration;
- When the total of all known transmissions exceeds one hour;
- On or before the battery replacement (expiration) date. ***Note: The battery pack (452-0133) expires 5 years from the date (month) it is shipped from Artex.***

When installing a new battery pack, remove the paper backing from the rubber seal at the connector end of the battery pack. It is recommended that this seal be coated with a non-petroleum based silicone grease (i.e. GE G-635) to provide a moisture resistant seal once the battery is installed.

To replace/reinstall the battery pack, connect the 8-pin connector to the header on the circuit board in the battery pack.

Connect the 2-pin connector to the recessed connector inside the ELT body. This step will cause the ELT to activate. Reset the ELT by toggling the "ON/OFF" switch on the ELT from "ON" to "OFF". Reseat the battery pack on the ELT, dressing the harness wires away from the standoffs to avoid pinching the wires between the battery pack and the standoffs.

Connect the SARSAT Beacon Test Set, **through a 30 dB (minimum) attenuator**, to the ELT's TPS connector. Activate the ELT and allow the ELT to transmit 3 to 4 406.025 MHz bursts. Thereupon, verify that there is not a "BAD FRAME" or "NORMAL BAD" message on the Test Set display which would indicate a problem with the battery pack (i.e. a bad IC on the battery circuit board).

Install the four Phillips head screws and tighten securely. Do not over torque the screws.

Once the ELT has been tested, as applicable, and reinstalled in the aircraft as described in this chapter, apply the battery expiration date label provided with the battery pack to the exterior of the ELT (i.e. on the end cap or other visible location).

Enter pertinent battery replacement information in the aircraft log book and fill out any other documentation required by local authority.

If you have any questions regarding the Battery Pack Replacement Procedure, please contact Artex Aircraft Supplies at 1-800-547-8901.

# **SPECIFICATIONS & APPROVALS**

<b>ELECTRICAL CHARACTERISTICS</b>	<b>121.5/243.0 MHz,</b>	<b>406.025 MHz</b>
OPERATING FREQUENCIES	121.5 & 243.0 MHz +/-0.005%	406.025 MHz +/- 2 KHz (initial) +/- 5 KHz (5 years) 2 parts/10E9 in 100ms
MODULATION	AMPLITUDE MODULATION (A3X)	BI-PHASE L (G1D)
TRANSMITTER DUTY CYCLE	CONTINUOUS	440 mSec (+/-1%) or 520 mSec (+/-1%) every 50 seconds (+/- 5%)
PEAK EFFECTIVE RADIATED POWER (PERP)	Minimum 50mW (17dBm) PERP for 50 hours at -20C or 100mW EIRP (20dBm) for 48 hours at -20C.	5 Watts (+/- 2dB) PERP or EIRP for 24 hours at -20 C
OCCUPIED BANDWIDTH	25 KHz Maximum	20 KHz Maximum
OPERATING TEMPERATURE	-20C TO +55C	-20C TO +55C
AUTOMATIC ACTIVATION FOR C406 Series,	VELOCITY CHANGE OF 4.5 Ft./SECOND	VELOCITY CHANGE OF 4.5 Ft./SECOND
AUXILIARY G-SWITCH ACTIVATION FOR C406-2HM,	5 AUXILIARY G-SWITCHES ACTIVATE AT 12 G's IN ADDITION TO THE MAIN G-SWITCH,	5 AUXILIARY G-SWITCHES ACTIVATE AT 12 G's IN ADDITION TO THE MAIN G-SWITCH
<b>ENVIRONMENTAL CHARACTERISTICS</b>	<b>121.5/243.0 MHz</b>	<b>406.025 MHz</b>
TEMP (STORAGE)	-55°C TO +85 °C	-55°C TO +85°C
TEMP (OPERATING)	-20°C TO +55 °C	-20°C TO +55°C
ALTITUDE	55,000 FEET	55,000 FEET

VIBRATION	10Gs,, 5Hz TO 2,000Hz	10Gs,, 5Hz TO 2,000Hz
SHOCK TEST	500Gs FOR 4 mSec	500Gs FOR 4 mSec
CRASHWORTHINESS	100Gs FOR 23 mSec	100Gs FOR 23 mSec
HUMIDITY	95% FOR 50 HOURS	95% FOR 50 HOURS
PENETRATOR DROP	55LBS FROM 6 INCHES	55LBS FROM 6 INCHES
CRUSH TEST	1,000 LBS	1,000 LBS
SPURIOUS EMISSIONS	AS PER CFR TITLE 47 (FCC) PART 87	AS PER RTCA/DO-204
<b>ANTENNA</b>	<b>121.5/243.0 MHz</b>	<b>406.025 MHz</b>
TYPE	VERTICAL MONOPOLE	VERTICAL MONOPOLE
RADIATION PATTERN	OMNIDIRECTIONAL	HEMISPHERICAL
IMPEDANCE	50 OHMS NOMINAL AT 121.5 AND 243.0 MHz	50 OHMS NOMINAL/VSWR LESS THAN 1.5:1
OPERATING SPEED	110-320: 350 KNOTS TAS 110-328-01,, 110-333 AND 110-337: MACH 1	110-320: 350 KNOTS TAS 110-328-01,, 110-333 AND 110-337: MACH 1
CABLE	RG-142 WITH BNC CONNECTORS	RG-142 WITH TPS AND TNC CONNECTORS
<b>WEIGHTS</b>	<b>C406-2 Series</b>	
ELT UNIT	3 LB 5.8 OZ. Max.	
MOUNTING TRAY	7.0 OZ.	
PROTECTIVE TOP COVER	6.7 OZ	
END CAP	3.8 OZ,	

ANTENNA	PART# 110-320 - 7.5 OZ. MAXIMUM PART# 110-333 - 12.5 OZ. MAXIMUM PART# 110-328-01 - 1 LB. 3.2 OZ. MAXIMUM PART# 110-337 - 1 LB. 5.0 OZ. MAXIMUM,
<b>MEASUREMENTS</b>	<b>C406-2 Series ELT</b>
ELT WITH MOUNTING TRAY,, PROTECTIVE TOP COVER AND END CAP INSTALLED	11.74" L x 3.90" H x 3.82" W
ANTENNA 110-320 110-328-01 110-333 110-337	HEIGHT 16.50" (BASE-TO-TIP HEIGHT) 9.00" (BASE-TO-TIP HEIGHT) 10.10" (BASE-TO-TIP HEIGHT) 7.75" (BASE-TO-TIP HEIGHT)
<b>BATTERY SPECIFICATIONS</b>	<b>C406-2 Series ELT</b>
TYPE OF CELL	LITHIUM MANGANESE DIOXIDE
VOLTAGE	12.0 VOLTS
AMP HOUR RATING	10.0 AMP/HOURS
REPLACEMENT BATTERY PACK NUMBER	PART NUMBER: 452-0133 - 406 LITHIUM BATTERY PACK

**APPROVED BATTERIES AVAILABLE FROM ARTEX OR ANY DEALER**

**ARTEX AIRCRAFT SUPPLIES, INC.**

**14405 KEIL ROAD N.E, AURORA, OREGON 97002**

**P.O. BOX 1270, CANBY, OREGON 97013**

**(503)-678-7929, (800)-547-8901, FAX (503)-678-7930**

**web site: [www.artex.net](http://www.artex.net)**

**e-mail: [infor@artex.net](mailto:infor@artex.net)**



## 5.1 C406-2 Series MODEL DESCRIPTIONS

Note: The C406-2 series ELT's are directly compatible with the ELT/NAV Interface Unit (453-6500)

- **C406-2:** The C406-2 is a **Type AF** (Automatic Fixed) ELT which transmits on 121.5 , 243.0 and 406.025 MHz. The ELT is enclosed within a multi-piece housing consisting of a mounting tray, a protective top cover and an end cap. It is provided as a complete system which includes an installation kit, a remote cockpit switch, two coax cables and an audible buzzer and a fixed dual input antenna.

- **C406-2HM:** The C406-2HM is a **Type AF** (Automatic Fixed) ELT which transmits on 121.5 , 243.0 and 406.025 MHz. The ELT was developed for helicopter installations and features an additional 5 "G" switches allowing the ELT to be activated in any of six axes. The ELT is enclosed within a multi-piece housing consisting of a mounting tray, a protective top cover and an end cap. It is provided as a complete system which includes an installation kit, a remote cockpit switch, two coax cables, an audible buzzer and a fixed dual input antenna.

## 5.2 APPROVALS:

### C406-2

- FAA TSO C126 (Environmental Categories: C1-BA204XRXXXXXZAZZ204BXXX) TYPE AF
- COSPAS/SARSAT (Certificate No. 112)
- JTSO-2C126

### C406-2HM

- FAA TSO C126 (Environmental Categories: C1-BA204XRXXXXXZAZZ204BXXX) TYPE AF
- COSPAS/SARSAT (Certificate No. 112)
- JTSO-2C126

**APPENDIX A**

**DOCUMENTATION & LICENSE**

**DATA**

### A.1. Available Documentation

An available document, which is highly recommended but not required, is Document No. RTCA/DO-182 entitled "Emergency Locator Transmitter (ELT) Equipment Installation and Performance" and may be obtained from:

RTCA Secretariat  
1140 Connecticut Avenue, N.W.  
Suite 1020  
Washington, D.C. 20036-4001  
(202) 833-9339

**CAUTION:**

Installation in a pressurized aircraft constitutes a major modification, consult the Department of Transport Regional Officer before proceeding.

### A.2. Radio Station License Data

With a current Private Aircraft Radio Station License, no further station licensing is required for the ELT installation.

A Private Aircraft Radio Station license may be obtained by filing FCC form 404.

The ELT may be installed, used and tested for up to 30 days without a station license after submittal of the FCC Form 404 and while awaiting receipt of the station license, provided a copy of the submitted FCC Form 404 is kept in the aircraft.

Installation and use in countries other than the U.S.A. shall be in accordance with that country's licensing regulations and in conjunction with the manual.

# **APPENDIX B**

## **REGISTRATION REQUIREMENTS**

## B.1. REGISTRATION

When a 406.025 MHz ELT is installed in an aircraft, it is imperative that the aircraft owner register the ELT. In the United States the National Oceanic and Atmospheric Administration (NOAA) is the registration agency. Each 406.025 MHz ELT contains a unique identification code that is transmitted to the satellite. This helps the "Rescue Coordination Center" (RCC) determine whether an emergency actually has occurred. The unique identification permits accessing a data base. In the United States the data base contains the following:

- Owner's Name
- Address
- Telephone Number
- Aircraft Type
- Aircraft Registration Number

This data facilitates inquiries as to the whereabouts of the aircraft, the existence of a flight plan and so forth. The above information should be kept up to date, with any changes to the data corrected (i.e. change of address, phone numbers, etc.).

The following address should be used to register and obtain information on how to register 406 MHz ELT's in the United States:

NOAA/NESDIS  
SARSAT Operations Division  
Code E/SP3  
Federal Building 4  
Washington, DC 20233

Following this page (B-2) you will find a registration form (570-1023) that can be used to register your 406 MHz ELT or to transfer ownership within the United States.

For Canadian Installations the ELT must be registered with the Canadian Beacon Registry of the National Search and Rescue Secretariat  
275 Slater Street, 4th floor  
Ottawa, Ontario  
K1A 0K2  
Telephone: 613-996-1505  
or 800-727-9414  
Fax: 613-996-3746

**WARNING:** If the ELT is moved to a different aircraft than which it was originally registered with, the ELT must be re-registered and the product label re-marked to indicate the new programming and/or new country of registry.

If the 406.025 MHz ELT is to be used in a country other than the United States, the Civil Aviation Authority in the applicable country must be contacted to obtain the correct registration form.

**APPENDIX C**

**SYSTEM COMPONENT PART**

**NUMBERS**

## C.1. SYSTEM & SUB-COMPONENT PART NUMBERS

The C406-2 series ELT's are available in four basic versions:

The C406-2 with Rod Antenna	455-5010-[___]
The C406-2 with Blade Antenna	455-5011-[___]
The C406-2HM with Rod Antenna	455-5012-[___]
The C406-2HM with Blade Antenna	455-5013-[___]

The above part numbers are for complete systems which include the ELT; a mounting tray; a protective top cover; an end cap; a remote switch kit; an antenna; an installation kit; a 6 foot BNC to BNC coax cable; a 6 foot TNC to TPS coax cable; an audible alert (buzzer); an Installation & Operation Manual; a warranty card; and an applicable beacon registration card.

The bracketed extension following the part number is a variable three digit number that signifies the Country Code. This identifies the county in which the ELT will be registered and for which the ELT is programmed. The Country Code designations are established by the COSPAS/SARSAT Secretariat. When ordering a C406 system or main assembly, it is necessary to inform ARTEX of the country of registry and the programming format required, so that the ELT can be programmed accordingly.

The part numbers for individual Line Replaceable components are listed below:

<u>ITEM</u> <u>NO.</u>	<u>DESCRIPTION</u>	<u>PART</u>
C406-2	Main Assembly, C406-2	453-5000-[___]
C406-2HM	Main Assembly, C406-2HM	453-5001-[___]
Blade Antenna	Antenna, 406 Blade	110-333
Blade Antenna	Antenna, 406 Blade	110-337
Rod Antenna	Antenna, 406 Rod	110-320
Battery Pack	Battery Pack, 406 Lithium	452-0133
End Cap	Cap Assy, Mounting Frame	452-5052
Protective Top	Frame Assy, Protective Top	452-3052
Mounting Tray	Frame Assy, Bottom Mounting	452-5050
Remote Switch	406 Remote Switch Kit	345-6196-04
BNC-BNC Coax Cable	Cable, Coax BNC-BNC 6 Ft	611-6013-04
TNC-TPS Coax Cable	Cable, Coax TNC-TPS 6 Ft	611-6052
Buzzer	Buzzer	130-4004
Installation Kit	Installation Kit, ELT	455-7421
Install Kit	Install Kit, Standard Remote Switch	455-6196
Manual	Installation and Operation Manual	570-5000



# **APPENDIX D**

## **ELT/NAV INTERFACE OPERATION**

## D.1. ELT/NAV Interface Capability

ARTEX has enhanced 406 MHz ELT operation by giving the C406-2 the capability of interfacing with an aircraft navigation system.

The C406-2 has the ability to receive position data (longitude and latitude) from the aircraft's on-board navigation system. The communication process between the ELT and the aircraft navigation system is made possible by installing an ARTEX ELT to NAV (ELT/NAV) Interface unit (453-6500).

The Interface unit also allows the ELT to be programmed with the aircraft's 24 bit address. When used with ELT's that are programmed for 24 bit protocol, the Interface unit is strapped with the 24 bit address or may be connected to a 24 bit address switch block which is set up to match the 24 bit address parity of the Mode S surveillance and communications system switch block. **Note:** There is no electronic connection between TCAS or Mode S systems and the ELT/NAV Interface, only the ID number is common. This feature was implemented in the ELT/NAV Interface unit with fleet operators in mind.

ELT's are programmed with either a serialized or 24 bit protocol. Both will interface with the ELT/NAV Interface to provide position data as part of the 406.025 MHz distress message however, only ELT's programmed with 24 bit protocol may be used with the 24 bit address function of the ELT/NAV Interface (see Section 4.3.16).

In the event of a crash, the ELT will transmit the converted position information from the navigation system, such as the GPS flight management computer, Ioran, etc. Geostationary satellites constantly

monitor the 406.025 MHz transmissions. The crash site is instantly known due to the aircraft's navigation system position data communication with the ELT via the Interface unit. Without the position data being transmitted, it is necessary for the polar orbiting satellites to pass overhead, using Doppler Shift technology to determine position. In a worst case scenario this could be a 3 to 4 hour wait for a polar orbiting satellite to pass over. In addition, the accuracy of the position fix is much better (i.e. 100 meters versus 1 to 2 kilometers for the standard 406.025 MHz system without interface coupling). The Interface unit supports either ARINC 429 or RS-232 data bus formats. An additional feature of the Interface unit is the ability to automatically reprogram the ELT with the aircraft's 24 bit identification (long message format). This facilitates moving the ELT from one aircraft to another when performing routine maintenance, etc.

**WARNING: the ELT must be re-registered and the product label re-marked to reflect the new programming and/or country of registry.** Contact ARTEX for details of marking and reprogramming.

The Interface unit will automatically reprogram the ELT (if programmed for 24 bit protocol), overwriting previously stored data every time the Interface unit determines from the aircraft's switch array, encoded with the 24 bit address of the aircraft, that the ELT has been replaced.

The standard choice of programming which ARTEX Aircraft Supplies, Inc. provides is serialized long message protocol. The serialized long message protocol can be used with or without the ELT/NAV Interface unit. The ELT/NAV Interface unit is required to interface with the aircraft navigation system and enables the ELT to transmit position data. The ELT can be used without the ELT/NAV Interface unit, however, the serialized long message will not have position data included.

Fleet operators may request that the ELT be programmed with 24 bit long message protocol. The interface with the aircraft navigation system which allows the ELT to transmit position data is unaffected by this protocol. The 24 bit address is designed to be used with the ELT/NAV Interface unit and allows the ELT to interface with the aircraft navigation system. The Interface unit should be strapped for the 24 bit address (binary "1" to ground) or connected to a 24 bit address switch block which is configured to match the 24 bit switch block connected to the aircraft's Mode S transponder system. The 24 bit strapping will allow the ELT to automatically program itself to the aircraft's 24 bit address. This feature will allow the ELT to be transferred between aircraft without having to reprogram or re-register the ELT with the Search and Rescue authority. This makes maintenance of the ELT a simple matter of replacing the ELT.

**The user must specify 24-bit long message programming when ordering the ELT.**

Figure D-1 depicts the typical installation configuration of the ELT, ELT/NAV Interface and related interconnections. Figure D-2 shows the wiring interconnection for the ELT with an ELT/NAV Interface.

## D.2. ELT/NAV Interface Communication Formats

The ELT/NAV Interface unit supports ARINC 429 and RS-232 data bus formats.

All ARINC 429 Standard and GAMA (high or low speed) serial bus formats are supported. Labels 310 (latitude) and 311 (longitude) are required.

The **only** RS-232 format which is supported is limited to the following conditions:

Baud Rate (fixed):9600

Parity: None

Data Bits:8

Stop Bits:1

In addition the RS-232 format must have a Start of Text (STX): an "A" identifier for latitude; a "B" identifier for longitude and END of Text (ETX). The format expects carriage returns but will not operate if there are line feeds.

The following manufacturer's navigation systems are known to interface with the ELT/NAV Interface system:

### ARNAV SYSTEMS INC.:

- R50, R50i, STAR 5000, FMS 5000, MFD (Multi-Functional Display).

### II MORROW:

- FLYBUDDY, 2001 NMS

### BENDIX-KING:

- KLN 88, KLN 90

### TRIMBLE:

- NAV 1000, NAV 2000, TNL 2100, and TNL3100. The following Trimble systems all require a RS-422 to RS-232 adapter: NAV 3000, TNL 1000, TNL 2000, TNL 2000A, TNL 3000, 2000 AP - PROACH, 2000 AP PROACH PLUS, 2101 AP PROACH, 2101 AP PROACH PLUS, 2101 I/O AP PROACH, 2101 I/O APPROACHPLUS.

For other equipment models contact that equipment manufacturer to determine if their equipment supports the ARINC 429 or RS-232 format specified above.

### D.3. Installation and Check-out Process

All installation processes and interconnections to navigation systems should adhere to the guidelines set forth in the FAA Advisory Circulars AC43.13-1A, 43.13-2A, 20-130A and 20-138, or later revisions of these documents. It is very important that the the Global Positioning System/Flight Management Computer (GPS/FMC) manufacturer's installation instructions be consulted regarding installation details that may be specific to the GPS/FMC. Refer to the installation instructions specific to the GPS/FMC that you are connecting the ARTEX ELT/NAV Interface unit to for specific instructions.

**NOTE:** In order to verify either the 24 bit address (mandatory) or navigation position provided by the ELT/NAV Interface that is being transmitted by the ELT, the ELT will only need to be active long enough to perform the "self test" and should not be active for more than 5 seconds. The 406 MHz output should be connected to the hand held test set (Artex P/N 453-0131) via a coax cable and a 30 dB attenuator. For any 406 MHz transmission after the ELT is active 47.5 seconds or more, the satellite system considers the transmission to be a valid distress signal. The ELT transmits a test signal at turn off which contains the same information as the distress message except that the signal contains a prefix code that identifies it as a "test message" that will be ignored by the satellite system should it be detected.

For all testing of the 406 MHz output, only the "test message" that is transmitted at turn off is required to verify the ELT and ELT/NAV Interface function.

Follow the installation instructions provided in the ARTEX **ELT/NAV Interface**

**Installation and Operation Manual** (570-4602) for details regarding the installation of the ELT/NAV Interface unit (453-6500).

It is extremely important that the ELT/NAV Interface installation not be in conflict with the GPS/FMC manufacturer's installation instructions in order to avoid an installation that may degrade the GPS/FMC performance. As a result, the Post Installation checkout in the GPS/FMC Installation Manual must be followed after installing the ELT/NAV Interface box.

**NOTE:** The updated hex ID **must** be verified for ELT's which are programmed for the 24 Bit Protocol and are installed with an ELT/NAV Interface which is strapped for the aircraft address. The ELT output must be verified for the correct aircraft address and the ELT **must** be labeled with the new 15 digit hex code ID. Refer to the ELT/NAV Interface Manual 570-4602 Section 3.7.2. For this test, the portable SARSAT Beacon Test Set (Artex P/N 453-0131) must be used. The 406 MHz ELT output (TPS connector in recessed area on front of ELT) must be connected directly to the hand held tester via a coax cable and a 30 dB attenuator. If using the existing antenna coax cable (TPS to TNC), a TNC to BNC adapter must be used to connect to the SARSAT Beacon Tester.

The portable SARSAT Beacon Test Set (ARTEX P/N 453-0131) must be used to perform the tests described in Section 4, paragraph 4.3.13 of this manual (570-0421). The hex code displayed on the tester should match the hex code which is on the ELT's product label. If received, the latitude and longitude displayed on the tester should match the latitude and longitude displayed on the GPS/FMC system. Verification of the latitude and longitude is desirable but is not required.

In addition, the ELT transmitter test described in Section 3, paragraph 3.7 of this manual (570-5000) must be performed. No error codes should be flagged by the ELT LED as described in step 5 of this paragraph.

#### **D.4. ELT to NAV Interface Information**

For details on the installation and use of the ELT/NAV Interface unit, please contact ARTEX Aircraft Supplies, Inc., at the following: Tel: (503) 678-7929, 1-(800) 547-8901 or FAX: (503) 678-7930 to request the brochures and Installation and Operation Manual (570-4602) for the ELT/NAV Interface unit.

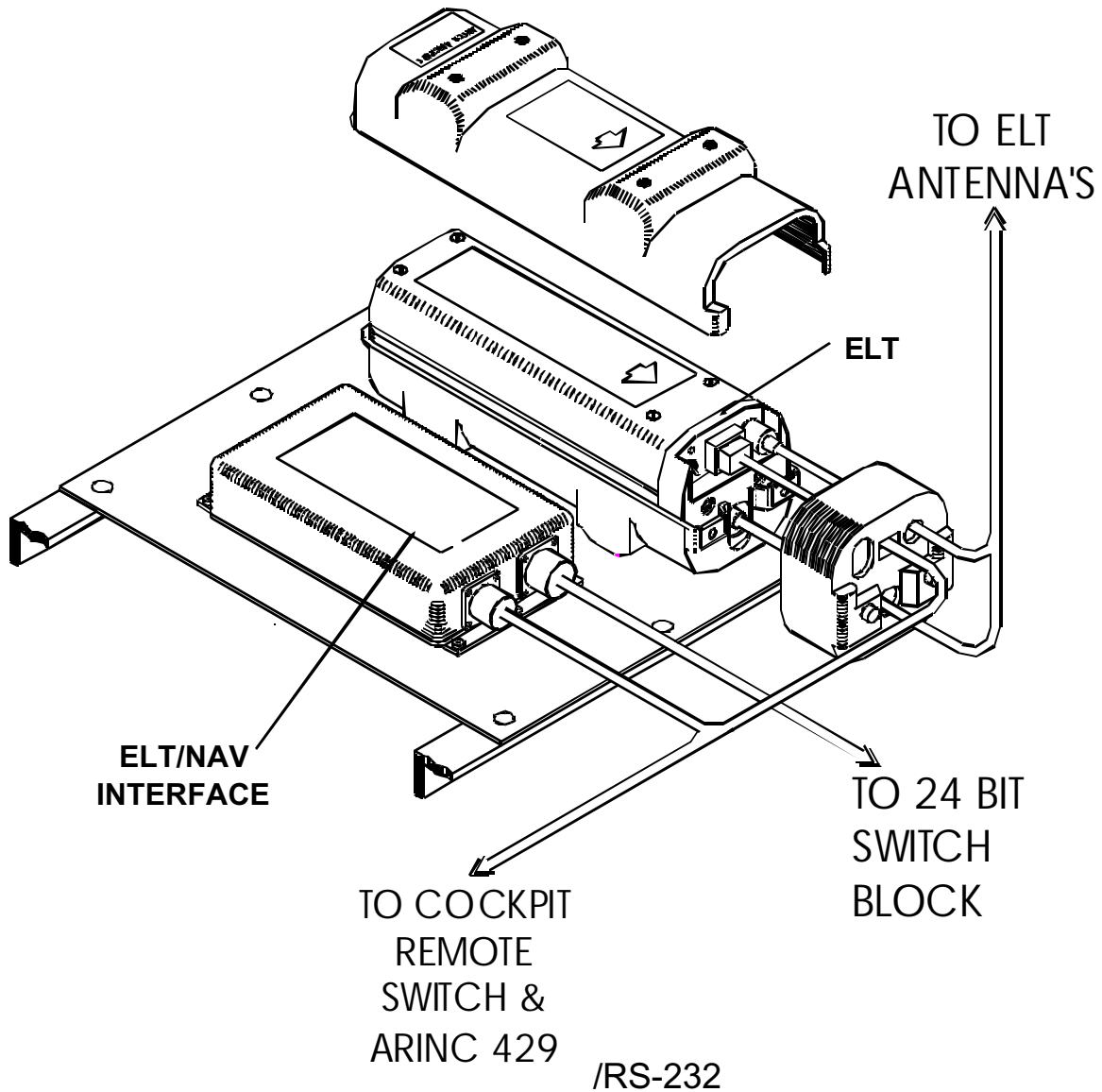


FIGURE D-1 ELT/NAV INTERFACE INSTALLATION OVERVIEW

## 24-BIT ADDRESS

24 BIT ADDRESS MAY ONLY BE USED WITH ELT'S PROGRAMMED FOR 24 BIT LONG MESSAGE PROTOCOL. ELT'S PROGRAMMED WITH SERIALIZED PROTOCOL USE POSITION FUNCTION OF ELT/NAV INTERFACE ONLY. PREFERRED METHOD TO ENCODE 24 BIT ADDRESS IS TO JUMPER BINARY "1" BITS TO PINS 25 AND 26 WHICH ARE INTERNALLY TIED TO GROUND VIA PIN 11 ON THE ELT/NAV INTERFACE. ALTERNATE METHODS INCLUDE USING A SWITCH BLOCK OR BY WIRING THE BINARY "1" BITS TO AIRCRAFT GROUND.

## GROUNDING

IF AIRCRAFT GROUND INTEGRITY CANNOT BE GUARANTEED BETWEEN THE ELT AND REMOTE SWITCH, REMOTE SWITCH PIN 6 IS WIRED TO ELT PIN 11. OTHERWISE CONNECTION IS OPTIONAL. IF ALL GROUNDS TO AIRFRAME OR AIRCRAFT ELECTRICAL BUS DC GROUND (WHICHEVER IS COMMON TO +28VDC BUS GROUND). ELT/NAV INTERFACE PIN 11 AND PIN 12 ARE INTERNALLY TIED. GROUND FOR ELT PIN 11 IS VIA CONNECTION TO ELT/NAV PIN 17

## REMOTE SWITCH

APPLY AIRCRAFT POWER +14VDC TO PIN 1, OR +28VDC TO PIN 3, BUT NOT BOTH. PIN 6 AND PIN 9 ARE INTERNALLY TIED.

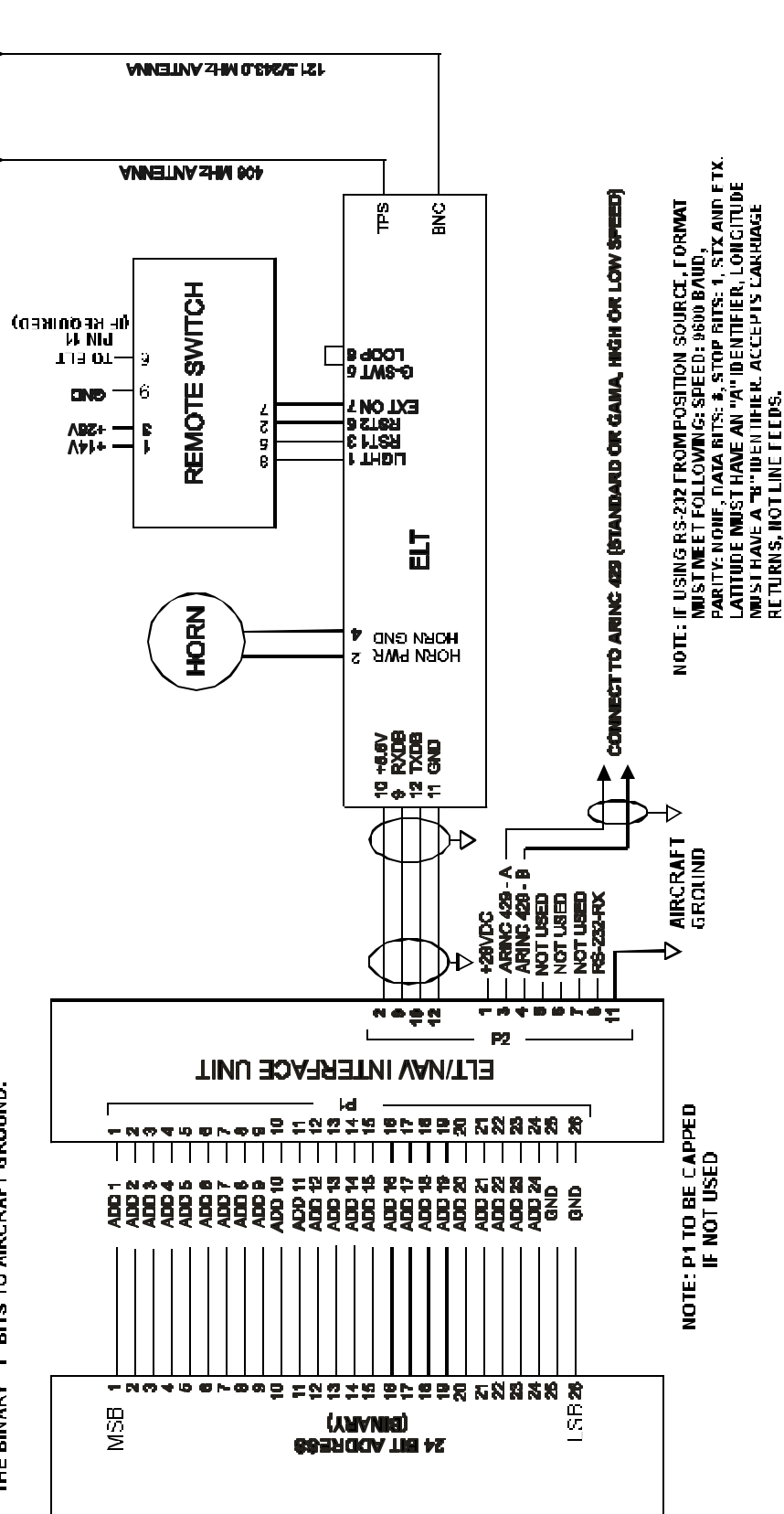


FIGURE D-2 ELT/NAV INTERFACE TO ELT WIRING DIAGRAM

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